ANY FARMER CAN BUILD A SMALL ELECTRIC CHICK BROODER AND PEN

The electric brooder pays worth-while returns right from the very start, because:

It's inexpensive to build.—The material costs very little.

It's cheap to operate.—Average brooding costs are lower, 1 to 3 cents per chick. The amount of money saved on 3 to 6 broodings often pays for equipment.

It does away with unnecessary work.—You don't have to get up at all hours of the night to keep an even temperature, you don't have to haul fuel, or clean out ashes.

It's automatic.—The brooder temperature keeps just right in unheated houses, even when it's way below freezing outside.

It helps keep chick mortality low.—Not only more chicks live, but they grow better.

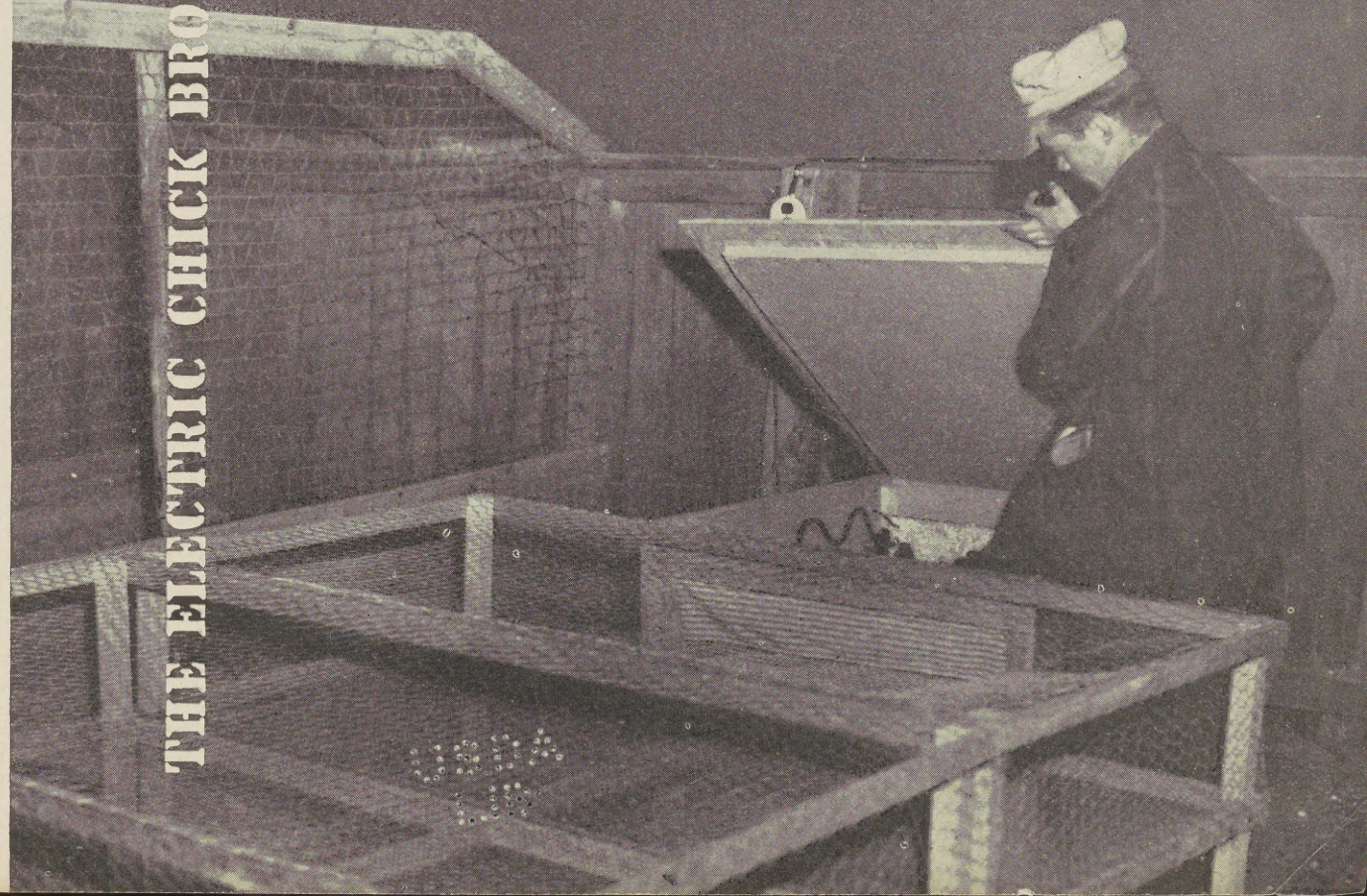
It does away with fire hazard.—No more danger from overheated old-fashioned brooders.

If you want to put electricity to work on your farm and you don't feel like you can afford making the investment required for factory-built equipment, you yourself can build the chick brooder described in this folder. This brooder will take care of 125 to 150 chicks comfortably, and is readily adaptable to conditions on your own farm. You can add on pen sections as the chicks grow; you can use the brooder indoors or outdoors. It will help you take an important forward step toward the profitable use of electricity.

MAKE IT YOURSELF

...and make money

THE ELECTRIC CHICK BROODER



First—BEFORE YOU BUILD BROODER, CHECK THIS COMPLETE LIST OF NECESSARY MATERIALS

Units	Thick, width, length	Cut from stock lumber materials	Use	Approximate cost	Source
12 pieces	2″ x 2″ x 29½″	2—2″ x 4″ x 12′	Pen posts	$0.65	Any lumber company.
4 pieces	2″ x 2″ x 16¼″		Brooder stand posts		
4 pieces	2″ x 2″ x 10½″		Hover posts		
4 pieces	2″ x 2″ x 8″		Ventilator posts		
3 pieces	1″ x 2″ x 28″	1—1″ x 4″ x 14′	Removable floor frame		Any lumber company.
2 pieces	1″ x 2″ x 34″	1—1″ x 4″ x 12′	Removable pen frame		
12 pieces	1″ x 2″ x 36″				
12 pieces	1″ x 2″ x 70″	3—1″ x 4″ x 12′	Pen frame		Any lumber company.
6 pieces	1″ x 2″ x 34″	2—1″ x 4″ x 12′	Cross braces for pens	1.66	Any lumber company.
1 piece	1″ x 4″ x 34¼″		Brooder hover front		
4 pieces	1″ x 2″ x 34¼″		Brooder stand frame		
2 pieces	1″ x 2″ x 36″		Door sides		
2 pieces	1″ x 2″ x 5½″		Door ends		
2 pieces	1″ x 2″ x 30″		Floor guides		
3 pieces	1″ x 12″ x 36″	1—1″ x 12″ x 10′	Fixed floor		Any lumber company.
4 pieces	1″ x 2″ x 36″	1—1″ x 4″ x 14′	Brooder stand frame		Any lumber company.
18 pieces	1″ x 2″ x 10″		Corner cleats		
2 pieces	1″ x 12″ x 36″	1—1″ x 12″ x 10′	Brooder hover sides	.40	Any lumber company.
1 piece	1″ x 12″ x 34¼″ (Shave down to 10⅞″ in width, for air inlet)		Brooder hover back		
2 pieces	1″ x 8″ x 34¼″	1—1″ x 8″ x 12′	Ventilator frame	.32	Any lumber company.
2 pieces	1″ x 8″ x 36″				
1 sheet of plywood	(Weatherproof preferred) 1″ x 40″ x 72″	1—1″ x 48″ x 72″	Brooder roof	.84	Any lumber company.

Units	Other materials	Use	Approximate cost	Source
1 gallon	Asphalt roof paint	Painting roof	$0.70	Any lumber company.
21 sets	Screen door hooks and eyes	Holding pen and brooder together	1.42	Any lumber company.
1 pair	2″ x 2″ butt hinges	Pen door hinges	.10	Any lumber company.
2 pieces	½″ x 36″ x 36¼″ Insulating board (4′ x 9′) (Use double layer ½″ thick.)	Floor insulation	1.26	Any lumber company.
2 pieces	½″ x 34″ x 34¼″ Insulating board (4′ x 9′) (Use double layer ½″ thick.)	Roof insulation		
1 piece	36″ x 22′ ¾″-mesh hardware cloth	Removable floor, pen floor, and bridge	2.37	Any hardware company.
1 piece	12″ x 9′ 1″-mesh poultry netting	Ends of pen	.15	Any hardware company.
1 piece	36″ x 28′ 1″-mesh poultry netting	Pen sides, pen top	1.08	Any hardware company.
1 piece	8″ x 34″ canvas curtain	Cover brooder front	.10	Dry goods store or mail order house.
1 piece	46″ x 7′ weatherproof canvas	Partial storm shelter for wire porches	1.35	
1	Brooder thermometer	Temperature testing	.50	Any hardware company.
1	1½″ round cork	Hold thermometer	.05	Any drug store.
3 pounds	6d nails		.15	Any hardware company.
2 pounds	Wire staples		.12	Any hardware company.
50	Corrugated fasteners		.08	Any hardware company.
1	Panel type brooder heater (300-watt with thermostat and pilot lamp).	Brooder heater	5.50	See the Superintendent of your REA system for details.
		Total cost of all materials	$18.80	

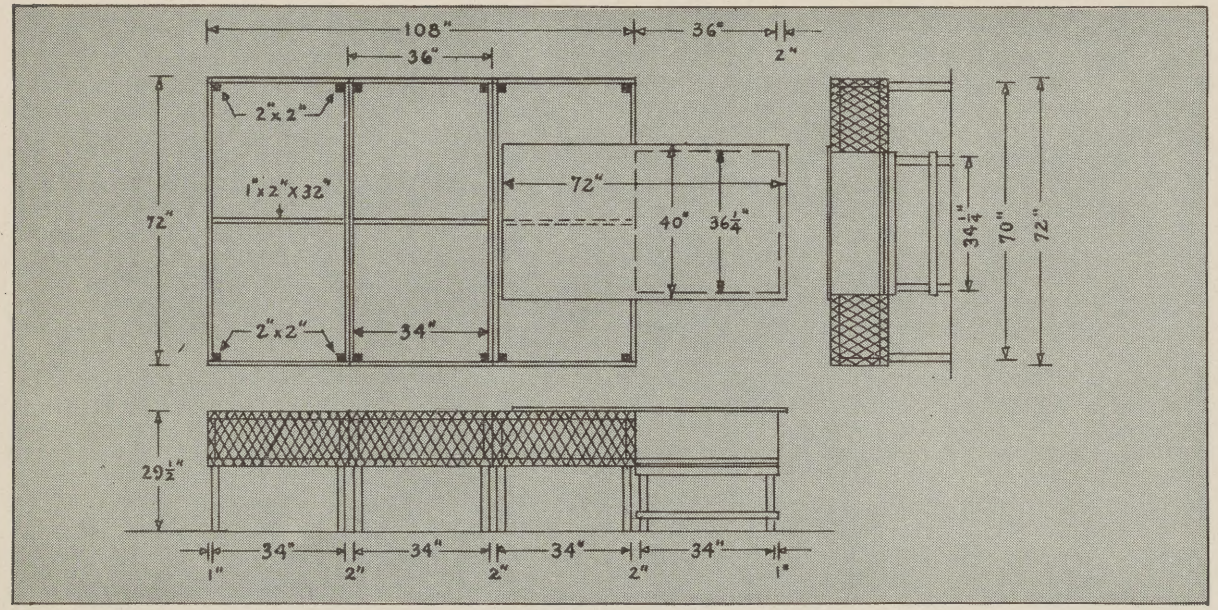
Tools: Claw hammer, hand saw, steel square, screw driver, tin cutters, pliers, brace, ¼″ wood bit, 1½″ expansion wood bit, ½″ wood bit, 4″ paint brush.

All wood should be sound, preferably cured.

If a power rip saw is not available, it would not be practical to buy and rip 1″ x 4″ stock; rather, the regular 1″ x 2″ lumber should be purchased, taking into account the changes in the numbers from those given in the attached specifications.

The brooder heater can be home-made if desired. See the Superintendent of your REA system for details.

Next—STEPS TO TAKE IN PREPARING MATERIALS FOR ASSEMBLY



A.—CUT STOCK MATERIALS TO SIZE

Stock materials referred to are normally handled by lumber dealers at ordinary prices.

1. Cut posts or legs to size.
   - Twelve—2″ x 2″ x 29½″
   - Four —2″ x 2″ x 16¼″
   - Four —2″ x 2″ x 10½″
   - Four —2″ x 2″ x 8″

2. Cut framing to size.
   - Twelve—1″ x 2″ x 36″
   - Twelve—1″ x 2″ x 70″
   - Six —1″ x 2″ x 34″
   - Three —1″ x 2″ x 28″
   - Two —1″ x 2″ x 34″

3. Cut boards for fixed floor.
   - Three—1″ x 12″ x 36″ (preferred) or
   - Six —1″ x 6″ x 36″ or
   - Nine —1″ x 4″ x 36″

4. Cut floor guides to size.
   - Two—1″ x 2″ x 30″

5. Cut sheet of plywood for roof to size.
   - 40″ x 72″

Secure a sheet of standard size 5-ply plywood, weatherproof type preferred. This board is for a roof and a shelter extending over part of the first pen. It must be at least 40″ wide, and length not less than 48″.

6. Cut ½″ insulation board for roof to size from 4′ x 9′ piece. 34″ x 34¼″ (two pieces).

   If not of the preferred weatherproof type, it must be treated with asphalt roof paint before installing.

7. Cut brooder hover sides and back to size.
   - Sides: Two—1″ x 12″ x 36″
   - Back: One—1″ x 12″ x 34¼″

   The sides should be shaved to 11½″ in width. The back is flush with the top of the posts, and the width should be shaved to 10⅞″ to make an opening or air inlet.

8. Cut brooder hover front to size.
   - 1″ x 4″ x 34¼″

   The front of the brooder is a 1″ x 4″ x 34¼″ placed 1″ above the top of the brooder posts.

9. Cut insulation for floor to size from ½″ insulating board 4′ x 9′ 36″ x 36¼″ (two pieces in order to give 1″ thickness).

   If not of the preferred weatherproof type, it must be treated with asphalt paint before installing.

10. Cut 12″ (1″-mesh) poultry netting for ends of pen.
    - One—12″ x 72″
    - Two—12″ x 18″

    The long piece is to cover the end of the pen farthest from the brooder. The two short pieces are to cover the end of the pen, on either side of the brooder proper.

11. Cut 36″ poultry netting for top and sides of pen.
    - Three—36″ x 100″

    These pieces are to fasten on the lower rail of each section, extending up over the top and down the other side, and fastening on the lower rail on the other side. Save the other 3′ for the ventilator.

12. Cut 36″ hardware cloth for floors to size.
    - Three—36″ x 72″

    Save the remaining 4′ for the removable wire floor.

13. Cut pieces for brooder stand frame.
    - Four—1″ x 2″ x 36″
    - Four—1″ x 2″ x 34¼″

14. Cut pieces for door frame.
    - Two—1″ x 2″ x 36″
    - Two—1″ x 2″ x 5½″

    This door is to fit in the end of the pen which adjoins the brooder.

15. Cut corner cleats.
    - Eighteen—1″ x 2″ x 10″

    Sixteen of these are to be used as corner cleats. Two are to be used for the sides of the opening in the pen section next to the brooder proper.

16. Cut pieces for ventilator frame.
    - Two—1″ x 8″ x 34¼″
    - Two—1″ x 8″ x 36″

    Later these pieces will be cut to the desired shape.

17. Cut out canvas curtain for brooder front.
    - 8″ x 34″

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Lastly—FOLLOW THIS ORDER IN ASSEMBLING BROODER AND PEN

B. ASSEMBLY OF BROODER

Use 6d common nails. Be sure to clinch all nails which extend through. The sections of the pen should be fastened together with screen door hooks and eyes. Pen should be fastened to the brooder with screen door hooks and eyes.
Corrugated fasteners will simplify construction by using them on the pen corner construction, center pieces of the pen, and the door frame.

B-1. Framing for floor.

Take the four 2" x 2" x 16¼" posts and fasten the 1" x 2" framing as in the drawing. Upper rails should be flush with the top of the posts so that fixed floor can be nailed to these frames.

B-2. Fixed floor.

The fixed floor consists of a lower section of two layers of ½" insulating board, and an upper section of 1" dressed lumber. Total thickness of the floor will be about 1¾". The lower section is fastened to under side of upper section by means of screws. Washers should be used on each screw. The assembled floor is then laid on the base frame with the corners of the insulating board resting on the corner posts of the base. Nail down. Floor and roof of the brooder should be weatherproofed with asphalt roof paint. To make it possible to replace the hover properly, it is necessary to place guides on the floor. These guides are 1" x 2" x 30" wooden strips which should be nailed on the floor just inside the hover sides and extend from the rear of the front post to the front of the rear post of the hover. The approximate distance of the strips from the edges should be 1", parallel to the edges. The ends of the strips should be about 3" from the edges of the boards to which they are perpendicular.

B-3. Removable wire floor.

Assemble frame for removable wire floor. Notch out 1" x 2" corners of pieces as in drawings and assemble as shown. This removable frame fits inside brooder and is held in place by the guides nailed to fixed floor. Cut a piece of ¾" hardware cloth to 30" x 34" from the 4' remaining (see paragraph A–12) and nail securely in place.

B-4. Brooder hover.

The four 2" x 2" x 10½" pieces are to be used as corner posts in building the brooder hover. The back of the brooder has an opening of ⅝" at the bottom next to the floor. Thus, it should be sawed ⅝" narrower than the sides, or 10⅞". Assemble the brooder as in the drawing. Be sure that the top of the sides and ends extend 1" above the top of the corner posts. The heating panel should be fitted to the front side of the rear posts of the brooder, making sure that the bottom is flush with the bottom of the two legs. Since, in the factory unit, the wires entering into one end of the heating unit form an obstruction preventing a flush fit, either the holes for these wires must be drilled closer to the center of the unit, or ½" to ¾" must be cut off from the opposite end of the unit to move the whole unit over. The front of the brooder is a piece 1" x 4" x 34¼" nailed in front of the legs and 1" above the top of the posts.
On the front end of the brooder, a curtain of canvas 8" x 34" should be fastened to the 1" x 4" so that it will extend down over the opening. The canvas should be scalloped, and hung 2" off the floor. The lower edge must be hemmed so that no loose threads can be eaten by the chicks.

B-5. Plywood roof with insulated ceiling.

Screw two eyes into each of the outer sides of brooder near the top, likewise corresponding hooks into the underside of the roof, so that plywood roof can be securely fastened. Location of the cover is shown in drawings. Thoroughly cover the entire board, including edges, with asphalt roof paint. One coat is sufficient. The two pieces of ½" insulating board 34" x 34¼" should be made to fit snugly into top of brooder with corners resting on the 2" x 2" corner posts. Inasmuch as tops of corner posts are 1" below the top of the side boards, the top of the insulating board will be flush with the top of the sides.

B-6. Brooder ventilator.

From the two pieces of 1" x 8" x 34¼", the two pieces of 1" x 8" x 36", and the four 2" x 2" x 8" posts, assemble the removable brooder ventilator. The side boards are cut as shown in diagram. The corner posts should be set so bottoms of the posts extend 1" below the bottom of the sides, and the tops 1" below the top of the sides (see diagram). Hooks and eyes are put into the sides of ventilator so it may be fastened to brooder and the plywood roof may be fastened to ventilator.

B-7. Installation and location of thermostat.

The thermostat, mounted inside the hover, should be fastened to one side, 7" from the lower edge and located centrally. Drill a ¼" hole to allow for manual operation from outside. The thermometer should be inserted through a 1½" hole 6" from the floor on one side. It hangs vertically from the end of a cork fitted into the hole. A wire loop should be firmly fixed into end of cork so that thermometer can be suspended in the brooder. The bulb of the thermometer should not be more than 2½" from floor. The hole should be in middle of hover side. The manual control of the thermostat should be on same side as temperature testing hole.

B-8. Brooder, general.

Back edge of the roof should extend 2" over end of brooder. Front edge of the roof extends 34" over the first pen section. The roof should lie flat against the top of the framework of pen. The roof can be removed and ventilator put on top the brooder proper. The plywood roof can then be replaced atop ventilator. The extending corner posts insure that ventilator rests in correct position. Guides on floor insure that hover sides are replaced properly. When ventilator is in place, a piece of 1" x 2" should be cut the proper length to fit vertically between the far edge of the roof and the cross brace of the top of pen to support the overhanging roof—the three held together by screen door hooks and eyes.

C. ASSEMBLY OF PENS

General.

These pen sections are simple framework with a floor of hardware cloth, ¾" mesh. The sides, ends, and top are made of 1" mesh poultry netting. Pens are fastened together and to hover with screen door hooks and eyes.
The door can be assembled with corrugated fasteners. It is attached by means of two 2" x 2" butt hinges and a hook and eye. Build the door frame to fit inside the upper and lower frames of this section. Staple the 1" netting to this frame. Cover pens with poultry netting as in drawings. As many pens can be added as desired.

Placing hardware cloth floor on section.

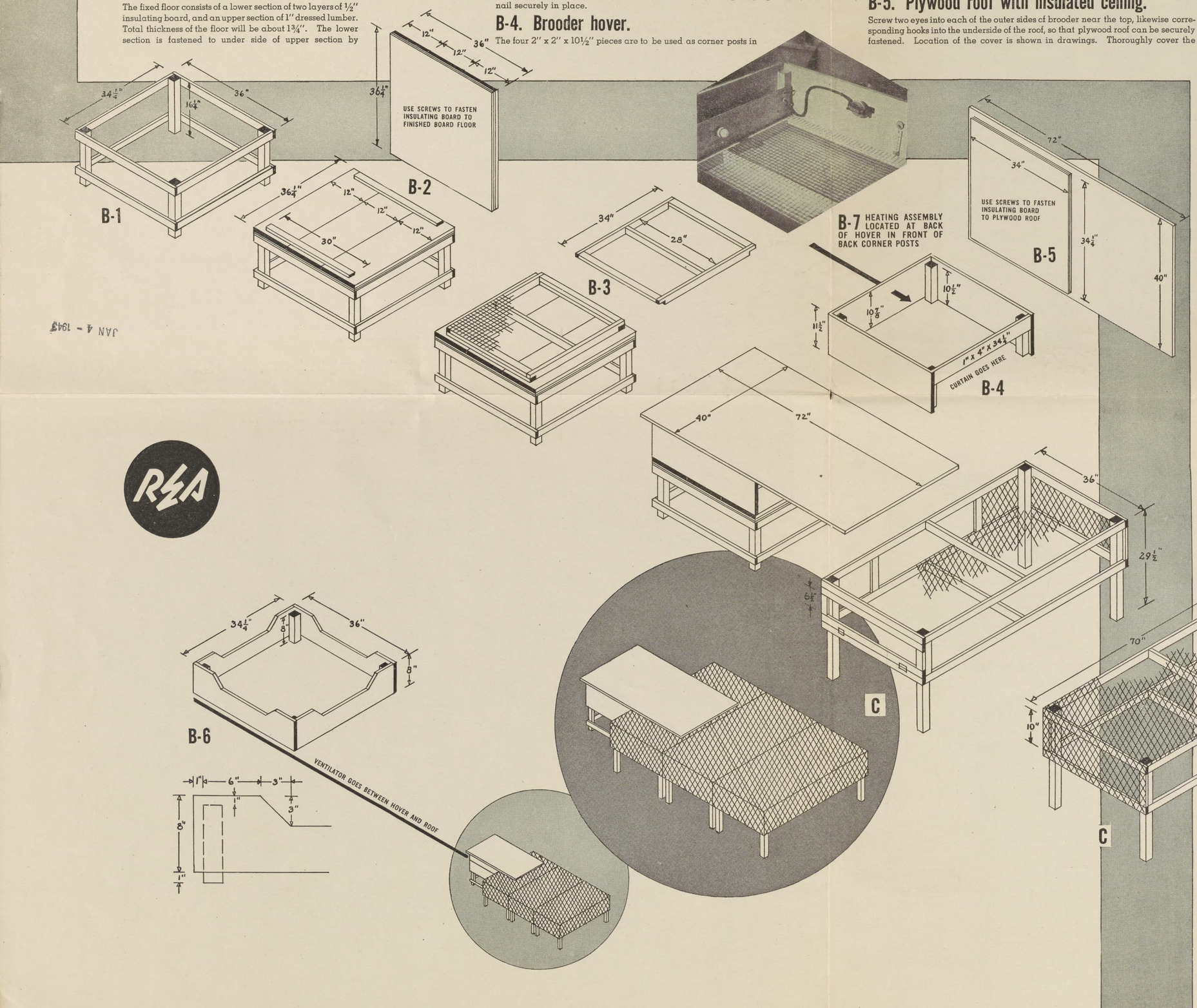
Hardware cloth in sizes of 36" x 72" is to be placed on top the rail of each section of the pen. Each corner of the cloth will have to be cut diagonally for a distance of about 4". This will allow the cloth to be turned up and stapled to the posts. The poultry netting of size 36" x 100" is to be stapled first to the lower rail on one end of each section and carried up over the top rail and down to the lower rail on the other end. This will completely enclose top and ends of each section. On pen nearest the hover, the overhang on the door side will have to be cut off and stapled to the door frame. Open ends of end sections are to be covered as described in paragraph A–10.

Canvas protection.

A piece of weatherproof canvas 46" x 7' ought to be on hand to throw over brooder pen for weather protection. Two 1" x 2" strips of lumber can be nailed on ends to hold down canvas.

Painting.

Entire brooder, inside and out, should be given two coats of outside paint, or else treated with asphalt roof paint.



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AFTER IT'S BUILT—HERE ARE SOME HELPFUL HINTS ON OPERATION

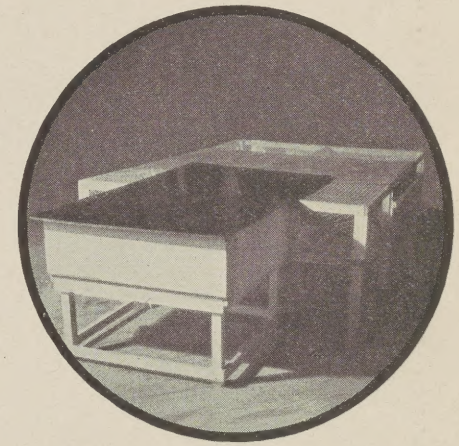
The season to start the brooder depends on the region and local needs. Advice can be secured from County Agricultural Agents; also from specialists of State Agricultural Colleges.

As for brooder temperature, at least 24 hours before chicks arrive the brooder should be put in operation, and the temperature set at 100 degrees F. Temperature should be set so that the chickens scatter evenly under the hover. When the chicks bunch near the center, the temperature is too low; when they crowd the edges, the temperature is too high; when they cluster to one side there is a draft. These conditions should be remedied immediately.

During the first few days the chickens should be confined rather closely to the hover. At least in very cold weather a windproof fence—cardboard, or 1" x 12" boards, or a band of sheet metal—should be set as close as possible, yet allow the feeders to stick out partially from under the hover. Each day the fence can be moved back a bit, until after about 5 days (regardless of how cold it is), the feeders are outside the hover. (In windy weather the brooder may need some sort of windbreak at front and rear). Having the fountains next to the hover usually prevents drinking water from freezing. At first much of the chicks' eating is done under the hover by means of the red attraction light. For the first few days it may be necessary to replace this light with an ordinary small bulb. Some poultrymen use 60-watt CX Mazdas for attraction lights. These lamps are a weak source of ultra-violet and do not increase the kilowatt-hours used.

Cold room brooding is best. Chicks do better under an electric brooder when absolutely no supplemental heat is used.

As the chicks get older, the porch area can be increased by adding other sections. In hot weather, if propping up the roof at one end does not provide sufficient ventilation, the roof can be lifted a few inches by a frame, as shown in the drawing of the ventilator. The ventilator can be screened with hardware cloth if desired. The use of hardware cloth floor considerably reduces the frequency of cleaning and greatly reduces the likelihood of disease epidemics. Before the chicks are removed from the brooder, regardless of age, they should be accustomed to roosting. This can be taken care of by providing roosting space in one or two sections. Shade and shelter for the latter part of the period can be provided by placing waterproof canvas, about 4 feet wide, across the top of part of the porch. The feed trough and hoppers and part of the roosts should preferably be under some type of shelter.



In cases of power interruption, a well insulated brooder will ordinarily take care of chicks, even when they are small and the weather cold, for at least 2 to 4 hours. But in any such emergency the chicks should be watched. By closing ventilators, heat losses can be greatly reduced. Sacks may be draped over at least a part of the outside edge of the brooder. In cases of prolonged outages, a jug of hot water, will ordinarily handle the situation.

Once you have built the brooder and put it into operation, you will find it worth while to keep records of your experience. You'll see for yourself what an electric brooder can do for you in dollars and cents.

RURAL ELECTRIFICATION ADMINISTRATION
U. S. DEPARTMENT OF AGRICULTURE

IT'S EASY TO OBTAIN THE MATERIALS NEEDED FOR THIS HOME-MADE FEED MIXER

If you have feed to mix, here is the practical answer.

It's inexpensive to build.—The materials can be purchased for only one-quarter the price of the smallest commercial feed mixer.

It mixes quickly.— 300 pounds can be mixed in 1 or 2 minutes.

It mixes thoroughly.—Tiresome shoveling in the mixing of feeds is replaced by a clean, more thorough mixing method.

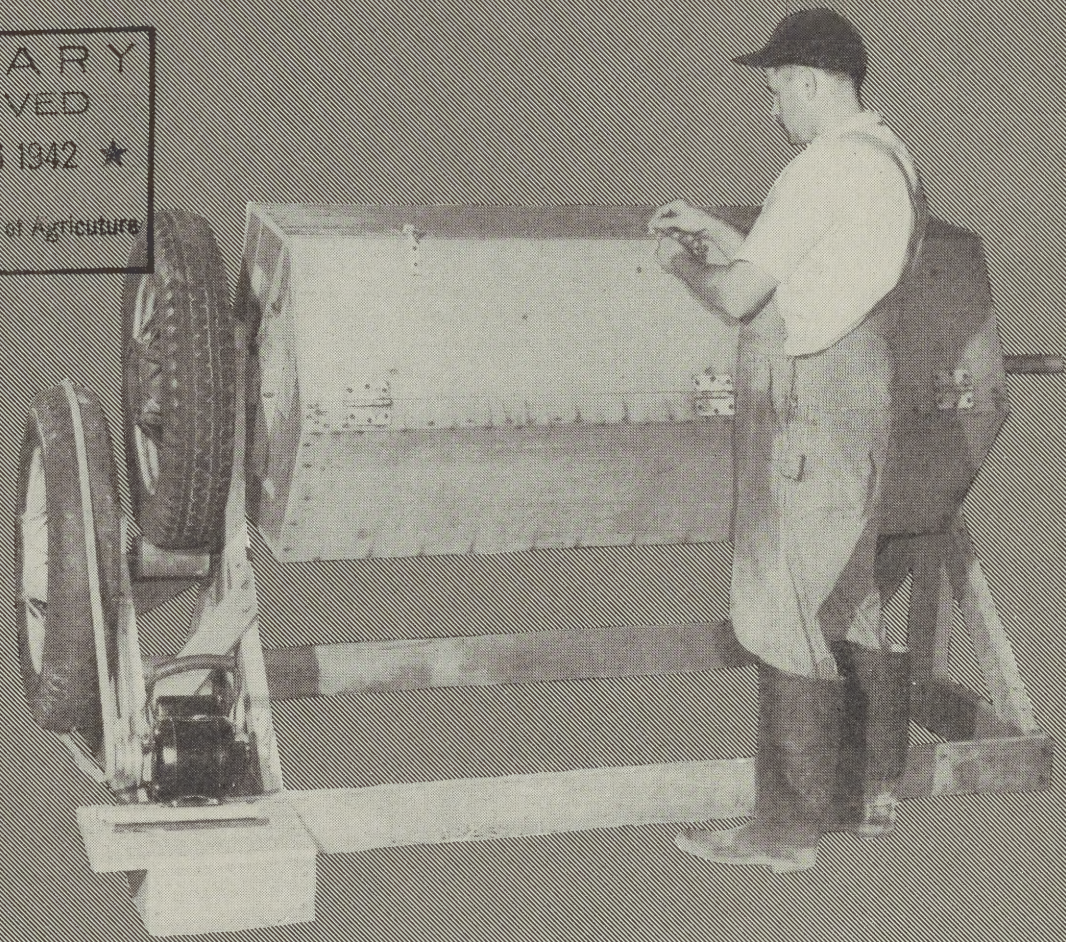
It operates cheaply.—The cost is only a cent or less per 1,000 pounds.

It is not necessary to buy another motor.—The mixer can be readily operated by a small portable motor, or a motor mounted on a motor toter.

Build this home-made feed mixer and eliminate those extra trips to have feeds mixed or to buy ready-mixed feeds. With this mixer you can improve your home-grown feeds by adding protein concentrates and have any mix you want when you want it. If you have an electric feed grinder, the feed mixer completes the program of home-grown, home-ground, home-mixed feeds. Such a home-feed program will reduce cost up to 50 percent under commercially advertised feed.

The home-made mixer is another example of low-cost investment in farm equipment. It is a money saver because it is a timesaver. Here is another use for the electric motor on your farm and another chance to take a forward step in the profitable use of electricity.

THE ELECTRIC FEED MIXER



MAKE IT YOURSELF AND MAKE MONEY

CHECK THIS LIST OF MATERIALS

HARDWARE

Units	Material	Use	Approximate Cost*
1	¾" galvanized iron pipe—18" long	Friction pulley shaft	$0.15
1	1" galvanized iron pipe—7' long	Box shaft	.80
1	¾" cast iron pipe flange	Lower wheel	.21
1	1" cast iron pipe flange	Upper wheel	.23
12	3" No. 8 wood screws	Attach box baffles	.10
30	1" No. 10 wood screws	Attach metal lid clamps and hinges	.15
12	2½" No. 10 wood screws	Attach upright braces	.10
8	3" No. 10 wood screws	Attach cross braces	.10
12	3½" No. 10 wood screws	Attach upright braces	.10
12	4" No. 10 wood screws	Assemble mixer base	.15
6	5/16" x 2½" carriage bolts	Attach uprights to base	.15
8	5/16" x 3½" carriage bolts	Attach box end braces	.20
2	5/16" x 4"carriage bolts	Attach mixer box to shaft	.05
4	5/16" x 5" carriage bolts	Shaft cleats	.10
2	5/16" x 4½" machine bolts	Attach motor mounting to base	.05
8	⅜" x 2½" machine bolts	Attach pipe flanges to discs	.20
10	½" x 2½" machine bolts	Attach wooden discs to wheels	.25
2	¼" x 3" round head stove bolts	Attach friction pulley to shaft	.05
3	5/16" x 3" machine bolts and wing nuts	Tighten lid clamps	.10
24	5/16" washers	With 5/16" bolts	.10
20	½" washers	Wheel assemblies	.10
2	1" washers	Friction pulley shaft	.05
2 lb	6-penny nails	Assemble mixer box	.20
3	3" T-hinges	Hinge box lid	.30
4	Cotter pins	Secure wheels to shafts	.05
6	⅞" x 3/16" x 6" pieces scrap iron	Shape into lid clamps	.15
2	Model "A" Ford wheels (used)	Speed reduction assembly	1.00
2	Tires to fit above wheels (used)	Speed reduction assembly	1.00
2	Tire inner tubes (used)	Speed reduction assembly	.50

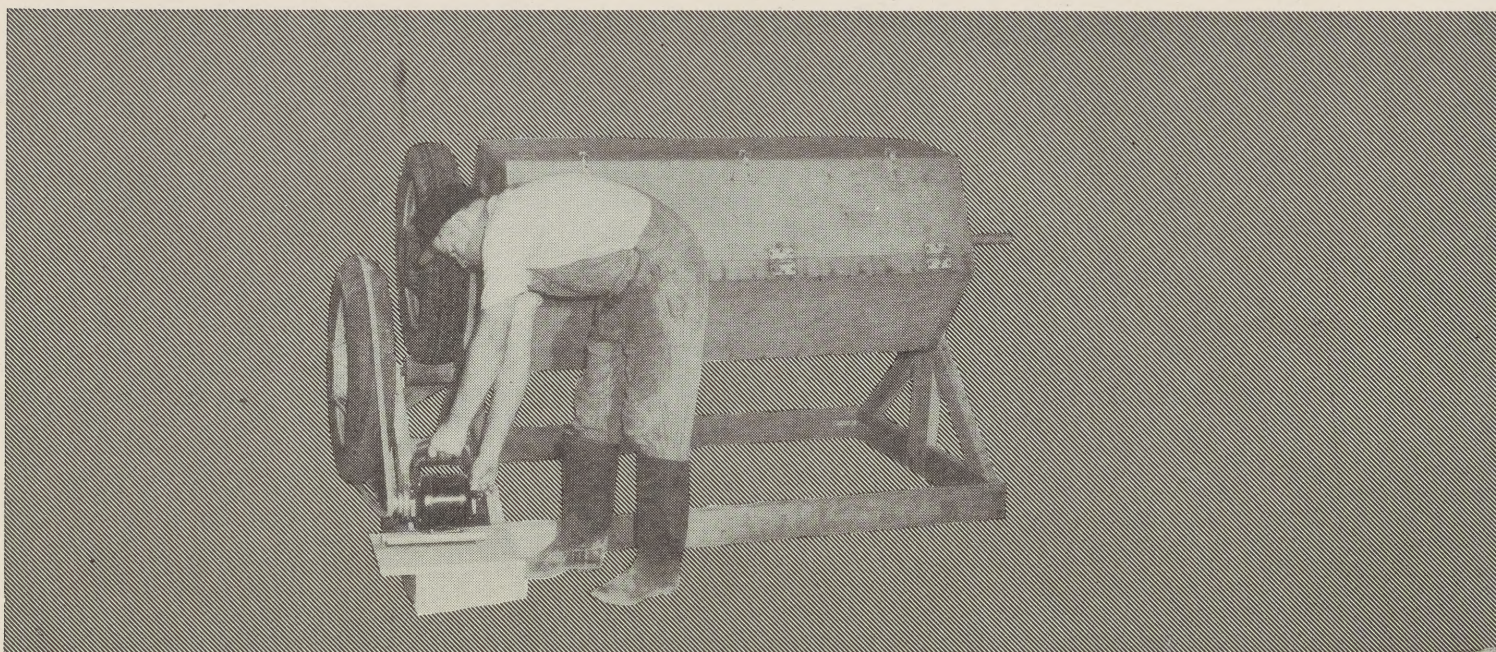
LUMBER—Hardwood

STOCK ITEMS Size	Units	PREPARED ITEMS Size	Units	Use	Approximate Cost*
2″ x 4″ x 5′	1	2″ x 4″ x 30″	2	Box end braces	$0.96
2″ x 6″ x 9′	1	2″ x 6″ x 40″ 2″ x 6″ x 24″	2 1	Uprights Upright	2.16
4″ x 4″ x 6″	1	3½″ diam. x 6″ long	1	Friction pulley	.15

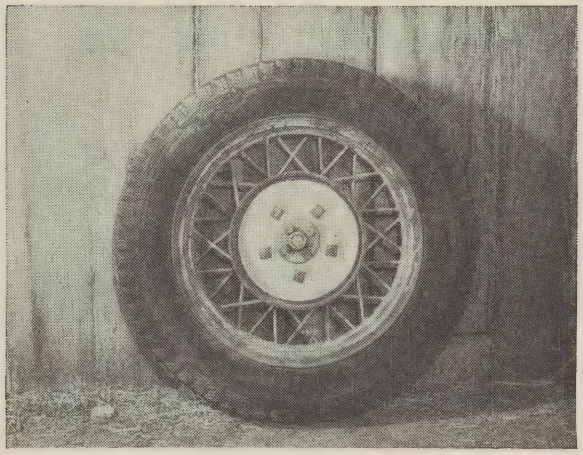
LUMBER—Softwood

1″ x 4″ x 14′	1	1″ x 4″ x 15″ 1″ x 4″ x 13″	4 8	End reinforcing strips for box End reinforcing strips for box	.48
1″ x 4″ x 14′	1	1″ x 4″ x 30″ 1″ x 4″ x 12″	4 3	Baffles for box Motor mounting base	.52
1″ x 6″ x 12′	9	1″ x 6″ x 64″	20	Box sides	3.50
1″ x 10″ x 15′	1	1″ x 10″ x 30″	6	Box ends	.60
2″ x 4″ x 16′	1	2″ x 4″ x 24″ 2″ x 4″ x 17″ 2″ x 4″ x 5″	6 2 2	Upright braces Upright cross braces Top shaft cleats	.48
2″ x 6″ x 14′	2	2″ x 6″ x 84″ 2″ x 6″ x 40″ 2″ x 6″ x 22″ 2″ x 6″ x 12″ 2″ x 6″ x 14″	2 3 1 1 1	Mixer base Mixer base Motor mounting base Motor mounting base Motor mounting base	1.96
2″ x 10″ x 2′	1	2″ x 10″ x 10″	2	Circular discs for wheels	.20
					$17.70

*Because of rapid price changes now, costs can only be approximate. The figures quoted here were the prevailing prices in the Washington, D. C. area on May 1, 1941. These prices may be more or less in other areas of the country.



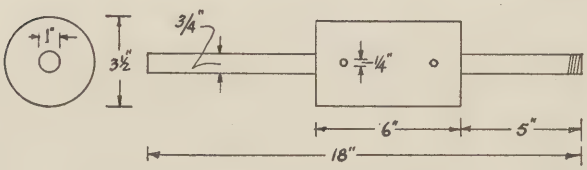
PREPARATION AND ASSEMBLY



WHEEL ASSEMBLY

This assembly has been devised especially for Model "A" Ford wheels. If auto wheels of a different size and model are used, variations in the assembly method may be devised.

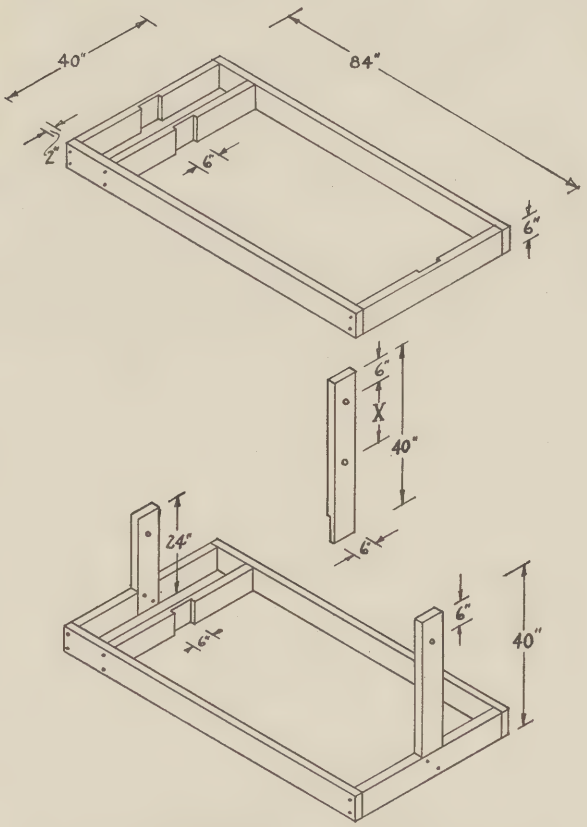
The two-wheel assemblies are alike except that the upper wheel has a 1" pipe flange while the lower a ¾" flange. From the 2-foot piece of 2" x 10" make two discs 9" in diameter. Bolt the pipe flanges to the center of the discs with ⅜" x 2½" machine bolts. Then, after drilling five holes in the discs to match the five lug holes in the wheels, bolt the discs to the inside of the wheels with ½" x 2½" bolts.



Shape the 6-inch hardwood piece of 4" x 4" into a cylindrical friction pulley 3½" in diameter and 6" long. Drill a 1" hole in the center through the length of the pulley. Thread one end of the 18" piece of ¾" iron pipe. After roughening the surface of the pulley, drive it onto the pipe to a point 5" from the threaded end. Then drill two ¼" holes across the diameter of the pulley and pipe, one at each end of the pulley, and fasten with countersunk ¼" x 3" stove bolts.

BASE AND UPRIGHTS

The base is made of five 2" x 6" softwood pieces, two cut 84" in length and three 40" length. The short pieces are notched in the center, as shown below, to receive the uprights which are also notched. The base is assembled with 4" No. 10 wood screws.

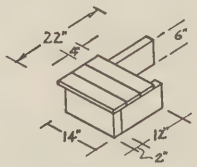


The three uprights are hardwood, preferably oak or maple, because they serve as bearings for the mixer box shaft and the friction pulley shaft. Two are 40" in length and one 24" in length. Each 40" upright has a 1¼" hole for the mixer box shaft, 6" below the upper end. The middle 40" upright and the 24" upright each have a 1" hole for the pulley shaft.

The dimension represented as "X" on the drawing is the distance between the centers of the 1¼" and the 1" shaft holes drilled in the middle upright. This distance equals the radius of the wheel with tire plus the radius of

the friction pulley. The radius of the pulley is 1¾" and the radius of the wheel and tire will vary between 14 and 15 inches. To assure adequate pressure between the tire and friction pulley, drill the hole slightly short of the total distance. The 1" hole in the 40" upright should be drilled and then drill 1" hole in the 24" upright the same distance from the base.

After these holes are drilled, bolt the two outer uprights to the base but not the center one till later.

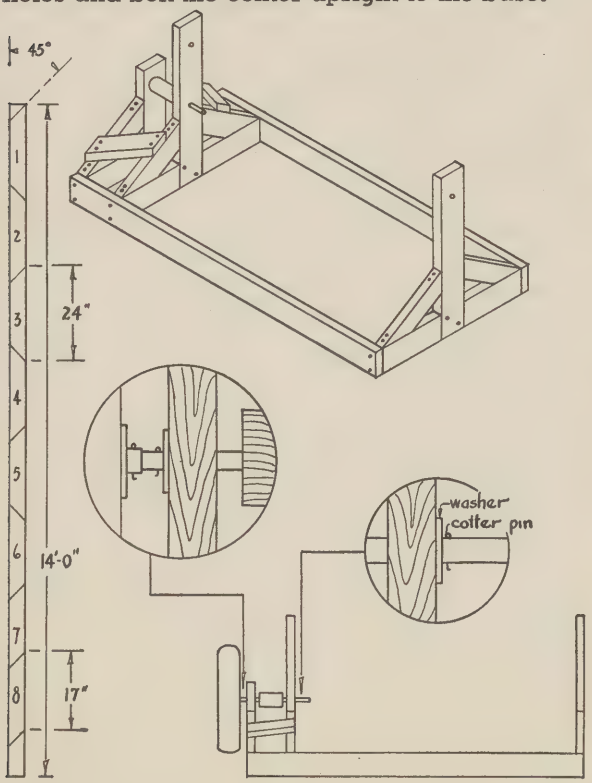


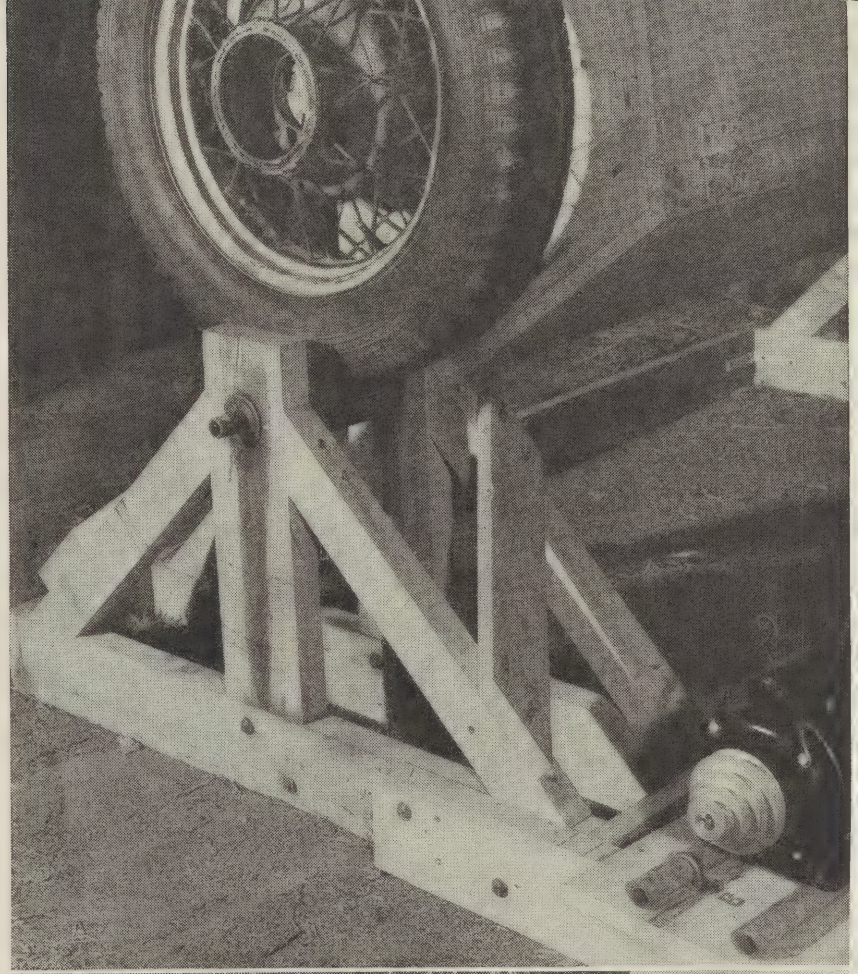
The motor base is made of one 14" piece, one 12" piece, and one 22" piece of 2" x 6" lumber. This base is covered with three 16" pieces of 1" x 4" material to make the platform. Bolt the 22" piece of the motor base to the corner of the mixer base near the wheel assembly with two 5/16" x 4½" machine bolts.

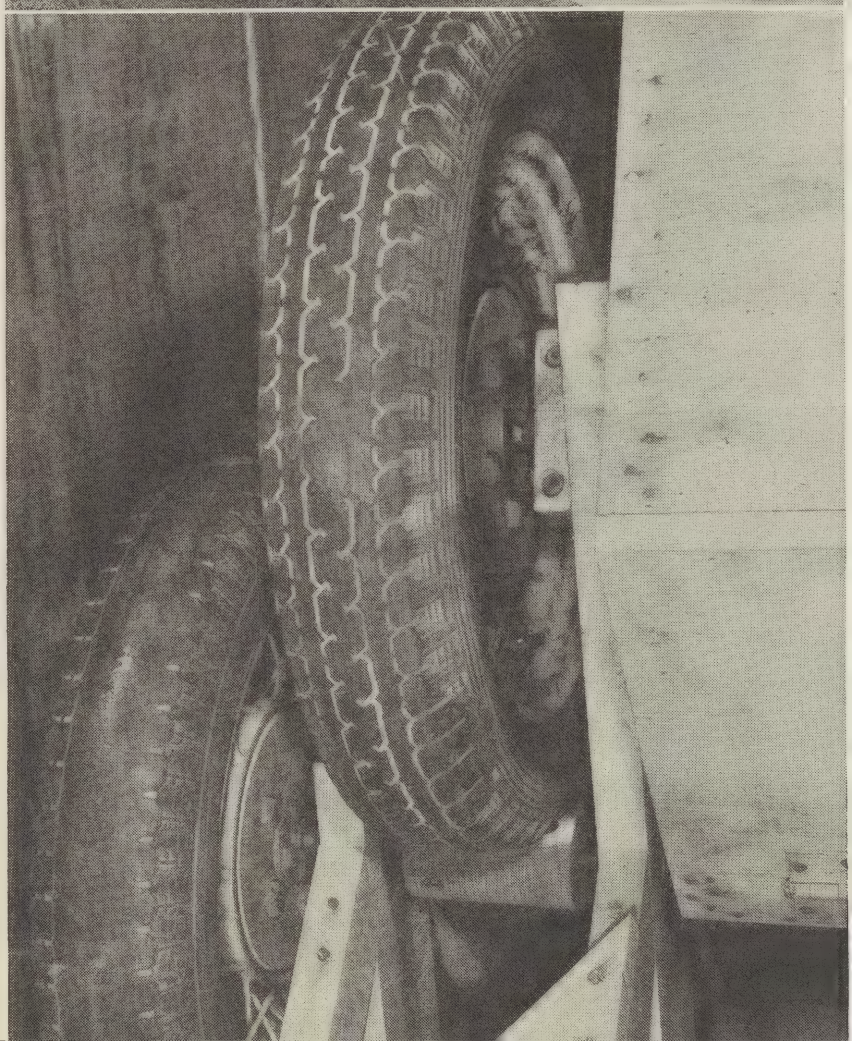
STAND ASSEMBLY

The friction pulley shaft is held in place by two steel washers and cotter pins located on the shaft next to the outer sides of the two uprights. Drill the two cotter pin holes in the shaft so that the friction pulley will be centered between the uprights.

Insert the friction pulley shaft in the proper holes and bolt the center upright to the base.

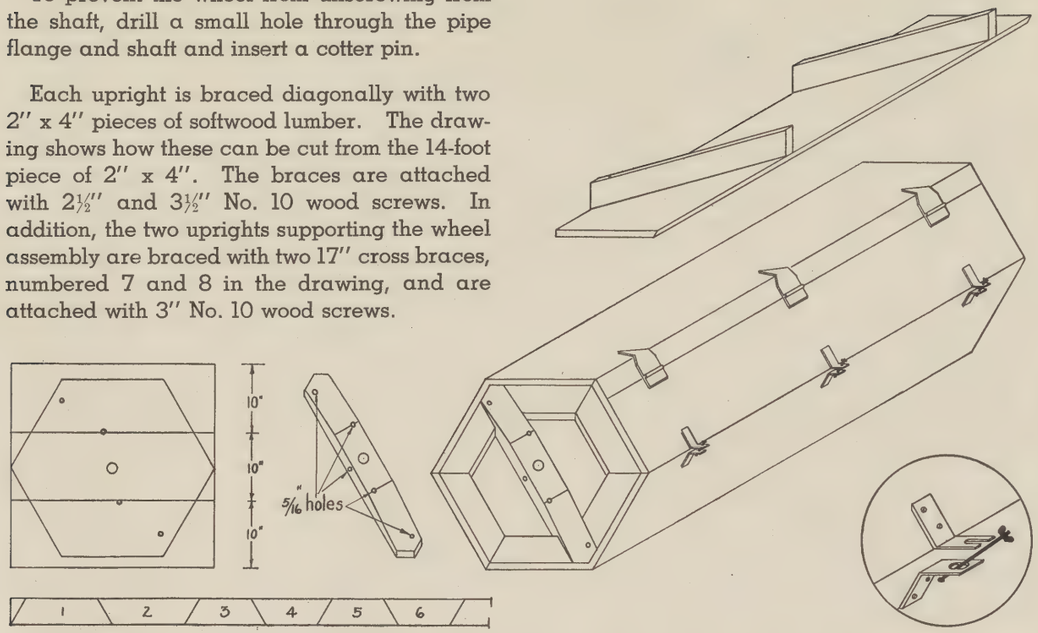






To prevent the wheel from unscrewing from the shaft, drill a small hole through the pipe flange and shaft and insert a cotter pin.

Each upright is braced diagonally with two 2″ x 4″ pieces of softwood lumber. The drawing shows how these can be cut from the 14-foot piece of 2″ x 4″. The braces are attached with 2½″ and 3½″ No. 10 wood screws. In addition, the two uprights supporting the wheel assembly are braced with two 17″ cross braces, numbered 7 and 8 in the drawing, and are attached with 3″ No. 10 wood screws.



MIXER BOX

The mixer box is six sided, one side of which is the lid. The sides and lid are made from 1″ x 6″ tongued and grooved lumber, cut 5′4″ in length.

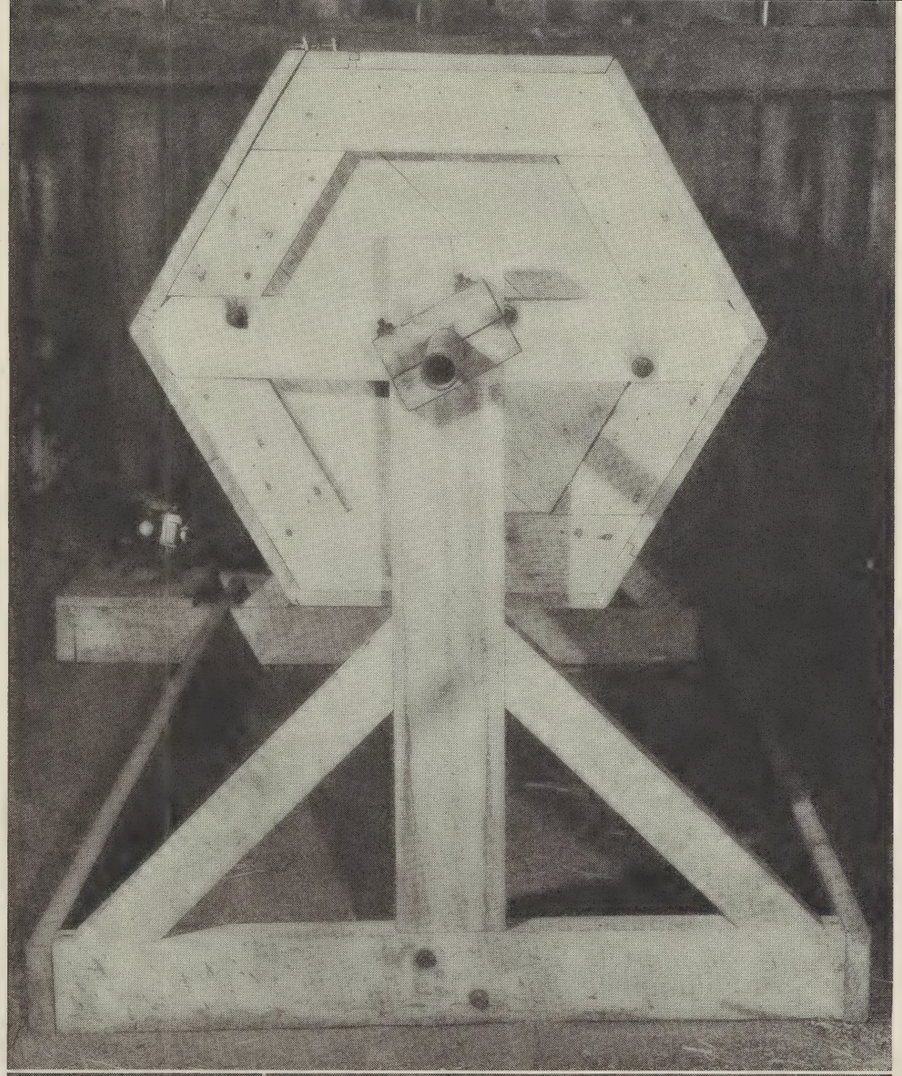
Each end of the box is made from three 1″ x 10″ boards sawed to form a hexagon with 15″ sides. The three pieces are held together by a 2″ x 4″ hardwood end brace 30″ long and are bordered by 1″ x 4″ reinforcing strips to give the ends added strength.

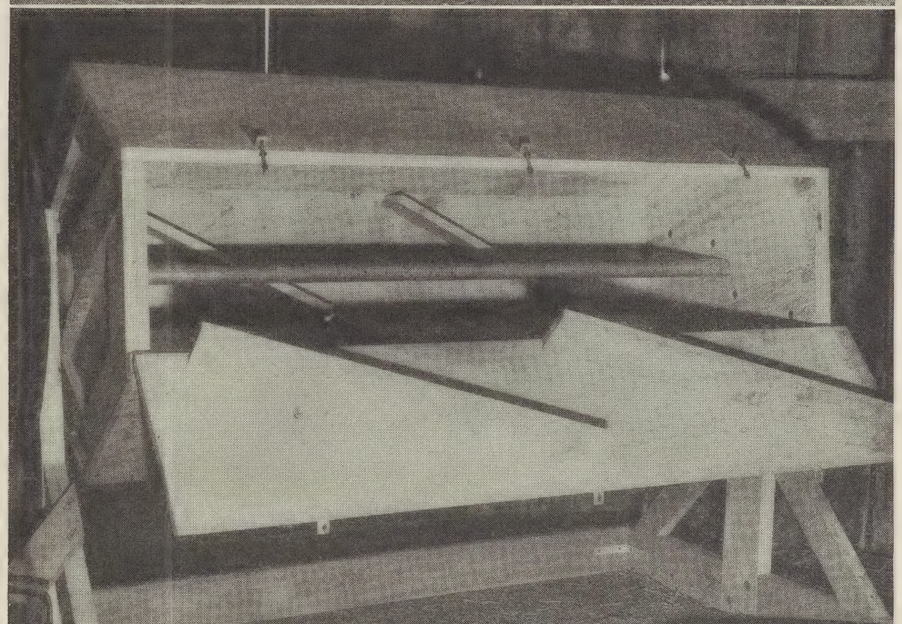
The hexagon can be marked out very easily with a piece of string. Place the three 1″ x 10″ boards together and locate the center point. With a 15-inch string mark out a 30-inch circle so that two points of the circle touch the sawed ends of the middle board. From one of these points draw a 15-inch line to another point on the circle. Continue around the circle till six 15-inch chords are drawn. Cut the boards along these six lines.

Lay out the hexagon, as shown, on the three 30″ x 10″ boards and saw each board to the desired shape. Then cut each end brace to size and drill five 5/16″ holes at the locations indicated in the drawing. Assemble the 1″ x 10″ boards to form the hexagon and drill four 5/16″ holes to match those in the hardwood end brace. Bolt the 1″ x 10″ pieces to the end brace with 5/16″ x 3½″ carriage bolts. Fit and saw the 1″ x 4″ reinforcing strips and nail them along the edges of each end as shown in the drawing. So that the reinforcing strips will fit properly, saw the ends at a 60° angle. After both ends of the box are assembled, drill a 1¼″ hole through the center of each for the pipe shaft.

Nail the 1″ x 6″ tongued and grooved side pieces to the ends and complete five sides of the mixer box leaving one side unfinished. To insure a tight joint along each corner edge of the box drive a nail every four inches across the length of the box.

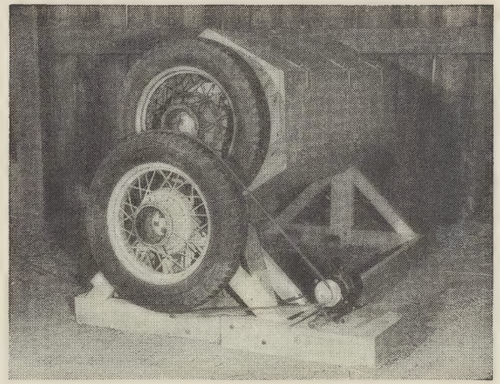
To improve the mixing action, attach two pairs of baffles on the inside of the box with 3″ No. 8 screws. Each baffle is cut 30″ long from 1″ x 4″ material. By attaching one pair of baffles to the lid, they serve as cleats to hold the lid together and keep it from warping. Attach the other pair of baffles to the side opposite the lid. Reverse the slopes of each pair of baffles.





Rip a strip 3″ wide from one of the pieces of 1″ x 6″ tongue and groove and nail along the edge of the unfinished side. This will provide a piece for attaching the lid hinges. Then use two 1″ x 6″ tongue and groove pieces to make the lid.

Fasten the lid to the box with three T-hinges and attach the lid clamps, as shown, with 1″ No. 10 wood screws.



Small investment—low cost—a real time saver

MIXER COMPLETE

After threading one end of 7-foot piece of 1″ iron pipe, hold the mixer box in position between the two uprights and insert the pipe through the uprights and box. The threaded end of the pipe should be above the friction pulley.

Screw the upper wheel to the pipe shaft and fasten with cotter key, as was done with the lower wheel.

Center the upper wheel on the friction pulley and the mixer box between the uprights; with a punch or nail, mark the pipe shaft where the 5/16″ holes in the end braces intersect the pipe. Pull shaft out and drill two 5/16″ holes to match those in the end braces. Insert shaft again and bolt the box to the shaft with two 5/16″ x 4″ carriage bolts.

From the two five-inch pieces of 2″ x 4″, prepare two pairs of cleats, as shown. After drilling the necessary 5/16″ holes, place the cleats on the shaft next to the outer sides of the two uprights; they are bolted together with 5/16″ x 5″ carriage bolts. The cleats prevent lateral movement of the shaft. Steel washers keyed in place with cotter pins may be used in place of the cleats if large enough washers can be obtained.

HINTS ON OPERATION

Capacity.—Although the feed mixer will hold more, it will operate better with not more than 300 pounds of feed in the box at one time. This fills the box approximately half full. Effectiveness of the mixer is decidedly reduced as the amount to be mixed is increased beyond 300 pounds.

If only one mix of feed is needed a day, the mixed feed can be removed directly from the box as used. If more than one mix is needed at one time, a sloping platform can be built on the base of the stand from sheet metal or boards. This will make it possible to empty each mix so it will slide to the floor at the side of the mixer where it can be shoveled into a feed cart.

General operation.—The mixer will mix all dry feeds very satisfactorily if care is taken to distribute each ingredient of the mix evenly throughout the length of the box.

By regulating the air pressure of the tire, it is possible to adjust the force between the upper wheel and the friction pulley. The tire on the lower wheel does not necessarily need much air in it.

Motor and wheel assembly.—The mixer is designed to be operated with any available electric motor of ⅓-hp. or more and with a rated speed of 1,700–1,800 r. p. m. A motor rated at this speed with a 2½-inch pulley will operate the mixer box at about 18 r. p. m.—the proper speed for good mixing. A motor with a higher rated speed will cause the box to rotate too fast.

Either a flat belt or a V belt can be used to drive the mixer. If a flat belt is used, it is desirable to use a paper or wooden pulley rather than a metal one on the motor in order to prevent slippage. The wheel assembly provides an inexpensive speed-reduction device which proved satisfactory in use.

Operating cost.—Since the mixer requires only a ⅓-hp. motor, it costs only a fraction of a cent to mix 300 pounds of feed. This amount can be mixed thoroughly in 1 or 2 minutes. If two mixes a day are prepared, it still will cost less than a cent a day to use the mixer.

The electric feed mixer turns home-grown and home-ground grains into prepared feeds at very low cost. Also, feed bought in bulk can be mixed cheaply. It is not necessary to pay to have feeds mixed elsewhere.

Other uses.—In addition to mixing feeds, the mixer has several other uses. It will be very useful in mixing fertilizers and seeds. It can be used for inoculating legumes with nitrogen-fixing bacteria cultures and treating seeds for disease control by mixing with powdered treatments. It will prove very useful in mixing other dry formulas. However, the box is designed to mix dry mixtures only.

After mixing these items, the box should be thoroughly cleaned and dried before mixing feed in it again.

OTHER "MAKE IT YOURSELF" FOLDERS

REA has developed other low-cost ways to put electricity to work on your farm. The "Make-It-Yourselfs" listed below are easy and inexpensive to build. They are all cheap to operate. Each of the folders describes in detail, by means of illustrations and specific instructions, how to build other useful electrical equipment for the farm. In a short time this equipment will pay for itself many times over.

The "Make-It-Yourselfs" are money-savers because they are timesavers. They make farm operations more efficient. Their use is an important forward step toward the more profitable use of electricity. They reduce much drudgery and provide better living on the farm.

Any of these folders are free upon request to:
Information Division,
Rural Electrification Administration,
Washington, D. C.

1. Electric Chick Brooder.
2. Electric Stock Tank Water Heater.
3. Electric Pig Brooder.
4. Electric Feed Mixer.
5. Small Portable Motor.
6. Motor Toter.

U. S. DEPARTMENT OF AGRICULTURE, RURAL ELECTRIFICATION ADMINISTRATION, WASHINGTON, D. C.

16—24308-1 U. S. GOVERNMENT PRINTING OFFICE

[no. 3]

IT'S EASY AND CHEAP TO BUILD AN ELECTRIC PIG BROODER

Few pieces of home-made farm equipment give so big a return for so little cost as the electric pig brooder.

It's a lifesaver for little pigs.—The electric heat prevents chilling when the weather is cold; and the chances of crushing by the sow are sharply reduced. Experience shows that three-quarters of all pig losses occur within 2 days after farrowing. The electric brooder usually cuts these losses by half, or even better.

It means more cash income.—Every pig saved means more money in your pocket at the time of marketing.

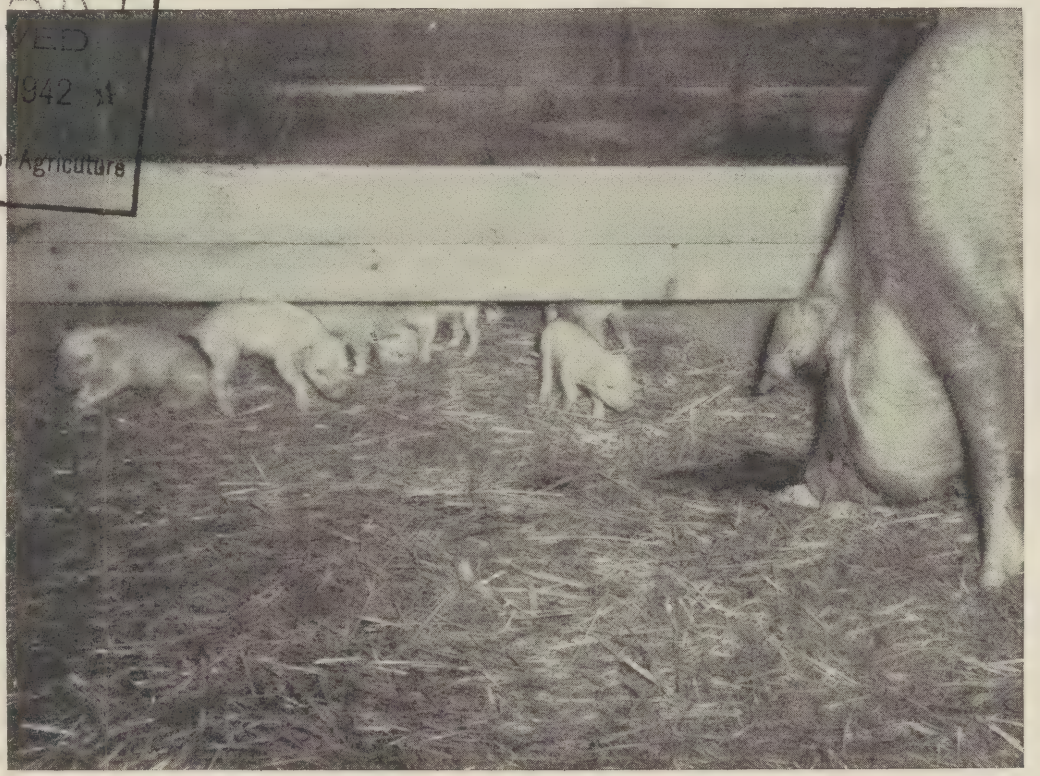
It costs very little to build.—The only material required is a little lumber, a reflector, an electric lamp, and a few odds and ends. More than likely you already have enough material on hand and it will take very little time to build it.

It's cheap to operate.—The operating cost is extremely low—only the cost of burning a 100- or 150-watt lamp.

It adds no fire hazard.—There is no danger of overheating for electric heat is steady and reliable.

If you want to put electricity to work on your farm with a low investment, you can build the electric pig brooder described in this folder. You can build this brooder to suit your own needs. You will probably be surprised at the way the little pigs run for the electric heat instead of the sow; and you will be pleased by the number of pigs you save. The electric pig brooder, costing so little to build and operate, will help you take an important forward step toward the profitable use of electricity.

THE ELECTRIC PIG BROODER



MAKE IT YOURSELF AND MAKE MONEY

First

• BEFORE YOU BUILD BROODER, CHECK THIS COMPLETE LIST OF NECESSARY MATERIALS

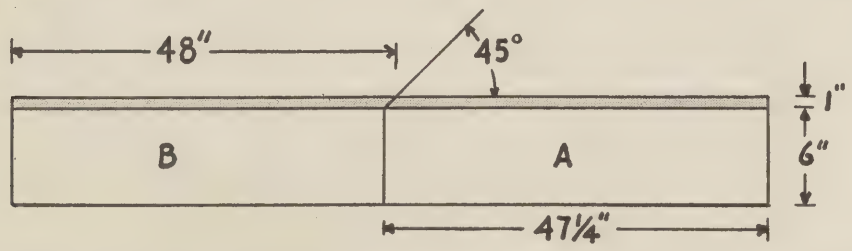
Units	Thickness, width, length	Cut from stock lumber materials	Use	Approximate cost	Source
1 piece	1″ x 12″ x 48″	1—1″ x 12″ x 8′	Brooder sides	$0.32	Any lumber company.
1 piece	1″ x 12″ x 47¼″				
2 pieces	1″ x 4″ x 67¾″	1—1″ x 4″ x 12′	Braces	.32	Any lumber company.
2 pieces	1″ x 6″ x 6′	1—1″ x 6″ x 12′	Brooder guard rail	.24	Any lumber company.
3 pieces	1″ x 4″ x 20″	1—1″ x 4″ x 6′	Guard rail braces	.15	Any lumber company.
1 piece	½″ 5-ply plyboard, triangular shaped (48″ x 48″ x 67¾″).	1″ x 48″ x 96″ will supply 4 roofs.	Triangular roof	.64	Any lumber company.

Units	Other materials	Use	Approximate cost	Source
1 strip	Strip hardware cloth, ½″ mesh 18″ x 18″, will supply 1 roof.	Keep reflector from falling through	$0.30	Any lumber company.
½ lb.	8d common nails		.05	Any lumber company.
½ lb.	6d common nails		.05	Any lumber company.
½ lb.	Wire staples		.07	Any lumber company.
1	14″ RLM reflector, enameled		1.25	Any electrical dealer.
1	100-watt or 150-watt lamp		.25	Any electrical dealer.
1	Weatherproof socket		.15	Any electrical dealer.
1	10′ rubber covered extension cord		.25	Any electrical dealer.
		Total	$4.04	

Tools: Light clawhammer, hand saw, tin cutters, steel square, keyhole saw.
Note.—All wood must be sound, preferably cured. Any local variety should be satisfactory.

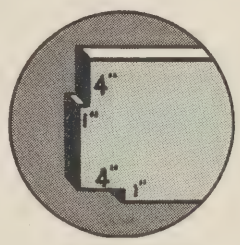
Next

CUT MATERIALS TO SIZE



1. Cut the 1″ x 12″ x 96″ board diagonally at 45°, in such a manner as to make two boards, A and B (Letters A and B refer to notation on drawing). The longer edge of A must be 47¼″ and the longer edge of B must be 48″. The opposite end of each board must be square. Notch the beveled end of each piece as shown in detailed drawing.

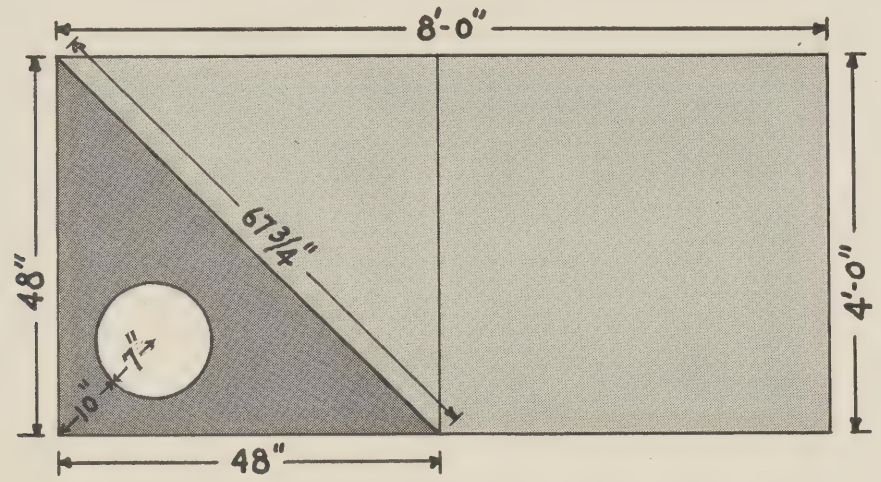
2. Cut the 1″ x 4″ x 12′–0″ board in half, for two braces of the required length. The braces may be fitted into the notches cut in the sides, and nailed. The corners may then be cut off flush with the sides to give a finished job.



3. Cut 1″ x 4″ x 6′–0″ board into three pieces 1″ x 4″ x 20″ for guard rail uprights.

4. Cut the ½″ mesh hardware cloth to 18″ x 18″, if not purchased in this size.

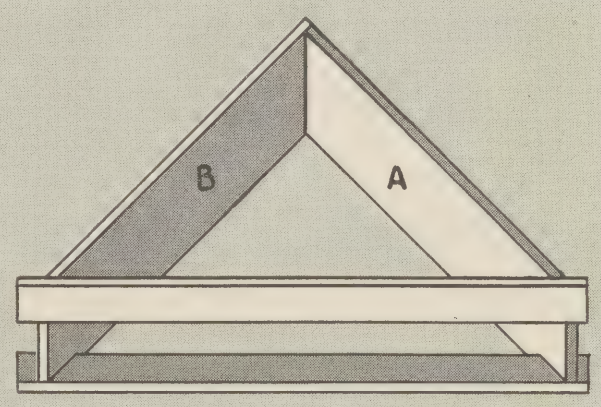
5. Cut a standard sheet of 5-ply plyboard, 4′–0″ x 8′–0″, ½″ in thickness, into two equal parts 48″ x 48″. Cut one piece diagonally from one corner to the opposite corner, making two triangular pieces size 48″ x 48″ x 67¾″. One standard sheet 4′–0″ x 8′–0″ will make 4 triangular shaped pieces suitable for the roofs of 4 brooders.



6. From the corner of the triangular plyboard, opposite the long side, draw a line to the middle of the long side. The midpoint of this line is 17″ from the long edge, and 17″ from the corner opposite the long edge. Using the midpoint as center, mark out a circle 14″ in diameter or with 7″ radius. Cut out this 14″ circle from the board using a keyhole saw or other cutting device for this purpose.

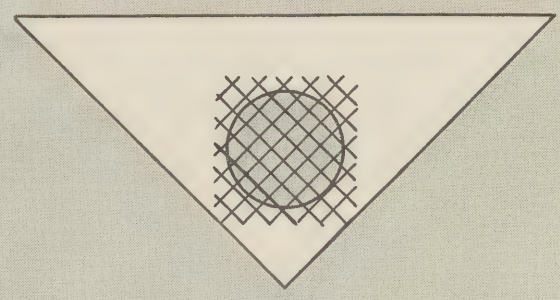
Lastly—FOLLOW THIS ORDER IN ASSEMBLING ELECTRIC PIG BROODER

1. Set up sides. The square end of the 1″ x 12″ x 47¼″ board (A) must be butted at right angles against the side of the 1″ x 12″ x 48″ board (B) at its square end. The ends must be flush. Nail these sides together with 8d common nails.

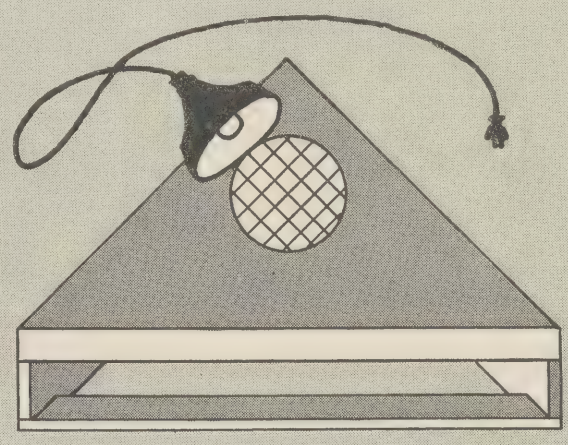


2. Fit and nail braces into the notches which were cut in beveled end pieces A and B. It will not be necessary to make any special diagonal cuts on these braces before they are fitted into the notches. When they have been rigidly nailed into place as shown in the drawing, the protruding corners may be sawed off flush with the sides. This will give a neat, well-finished appearance to the job.

3. Staple the 18″ x 18″ hardware cloth to the lower side of the plyboard roof, covering the 14″ hole.

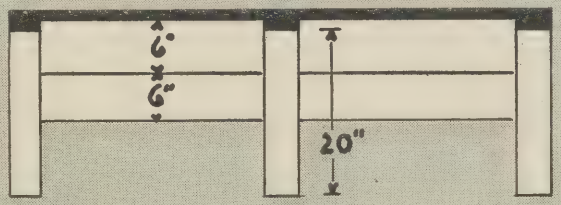


4. Fit the plyboard roof into place as indicated by the drawing. It should be nailed to the top edges of the sides and top front brace of the brooder. Use 6d common nails.

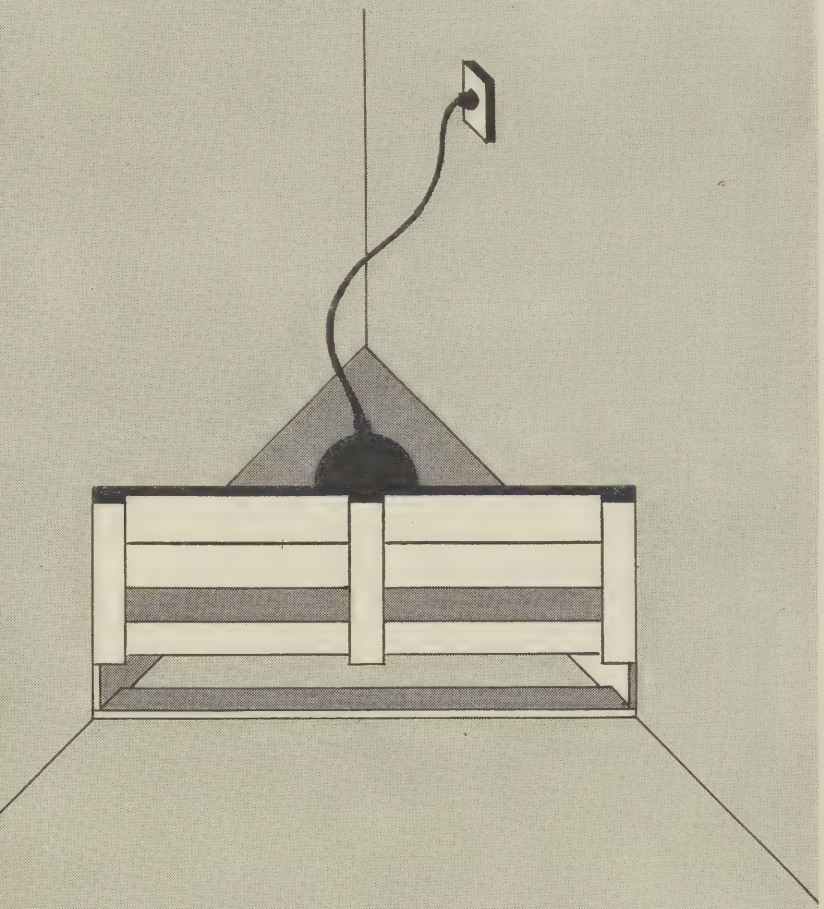


5. Insert lamp assembly and 14″ reflector in roof hole so that lamp cannot move out of position.

6. Take the three 1″ x 4″ x 20″ pieces and the two 1″ x 6″ x 6′–0″ pieces and assemble guard rail as shown in drawing.



Place the brooder in corner of farrowing house. Nail the guard rail to brooder as shown and toenail guard rail ends to pen sides.



AFTER IT'S BUILT, HERE ARE SOME HELPFUL HINTS ON OPERATION

The brooder in operation.—The sows should be placed in the pens a day or so before farrowing, and the heat turned on in the brooder several hours before the pigs arrive. The heat is ordinarily kept on continuously for 10 days, and if the weather is cold, often for 2 weeks. The pigs can be placed under the brooder by hand till they learn to go under voluntarily. In some cases placing the pigs under the brooder once or twice is sufficient, while in other cases it takes a day or two of training or occasional attention. Keeping the pigs under the brooder (by blocking the brooder entrance) for several hours soon after they are born, until they are warm and dry, is generally helpful.

Guard rails should never be removed when brooders are installed.

The brooder must always be securely fastened in place. If it is desired to move the brooder from one farrowing pen to another provision should be made to bolt it securely in place in each pen.

Equipment used, energy consumption.—The reflector is ordinarily about 12″ or 14″ in diameter and should be deep enough so that the bulb will not touch the hardware cloth on which it rests. This cloth serves as a protection to the lamp, without obstructing the flow of heat.

If the farmer preferred, a satisfactory reflector can be made from a deep aluminum cake pan.

Heat requirements vary according to temperature, but in general the 150-watt bulb is satisfactory. The reflector for a 150-watt bulb is 14″ in diameter. With a 150-watt bulb, the normal energy consumption per litter is around 36 kw.-hr., and should never exceed 50 kw.-hr. per litter.

Protection of brooder.—The sow often has a tendency to break up the brooder, so a tight barricade of boards is placed in front of the brooder from a height of about 2′ 3″ above the brooder and extending down so as not to leave over 3″ or 4″ between the top of the brooder and the bottom of the barricade. Be sure the cord to the reflector and bulb is out of reach of sow.

RURAL ELECTRIFICATION ADMINISTRATION • U. S. DEPARTMENT OF AGRICULTURE

WASHINGTON, D. C.

U. S. GOVERNMENT PRINTING OFFICE 16—20332

IT'S EASY TO BUILD AN ELECTRIC STOCK TANK WATER HEATER

For the farmer who has livestock, and lives in a cold climate, the electric stock tank water heater can be very valuable.

It eliminates ice breaking in winter.—Saves time and trouble for the farmer in freezing weather.

It provides warmed water for stock.—They drink more; tests show beef cattle are apt to gain extra weight, dairy cattle are apt to give more milk.

It's inexpensive to build.—The required material costs little, and old lumber can be used.

It's cheap to operate.—The operating cost depends on temperatures and amount of water drunk. In an Idaho test less than one-fourth kw.-hr. per cow per day was required to keep the water warm. Figure the cost at your own rate.

It's automatic.—Thermostat regulates water temperature; heater doesn't need tending every cold day.

If you want to put electricity to work on your farm with a low investment, you can build the electric stock tank water heater described in this folder. Like certain other kinds of electric farm equipment, you can build this heater to suit your own needs. The electric stock tank water heater is a money-saver because it is a time-saver. It may also add to your income by improving your stock, or by increasing the amount of milk your cows give in winter. It will help you take an important forward step toward the profitable use of electricity.

MAKE IT YOURSELF AND MAKE MONEY

THE ELECTRIC STOCK TANK WATER HEATER

FIRST

CHECK THIS COMPLETE LIST OF NECESSARY MATERIALS

Units	Thick, width, length	Cut from stock lumber materials	Use	Approximate cost	Source
2 pieces	1″ x 4″ x 30″	1″ x 4″ x 10′	Sides of middle frame	$0.14	Any lumber company.
2 pieces	1″ x 4″ x 22″		Ends of middle frame		
2 pieces	1″ x 8″ x 30″	1″ x 8″ x 10′	Sides of top frame	.27	Any lumber company.
2 pieces	1″ x 8″ x 22″		Ends of top frame		
1 piece	1″ x 4″ x 28¼″	1″ x 4″ x 3′	Heating cable support	.04	Any lumber company.
2 pieces	1″ x 8″ x 30″	1″ x 8″ x 10′	Sides of bottom frame	.27	Any lumber company.
2 pieces	1″ x 8″ x 22″		Ends of bottom frame		
3 pieces	According to water depth plus 3″	1″ x 4″ x 5′	Legs	.08	Any lumber company.
1 piece	1″ x 8″ x 36″	1″ x 8″ x 36″	Long leg	.10	Any lumber company.

Units	Other materials	Use	Approximate cost	Source
1 piece	8″ grooved wood strip or 16″ of quarter round or 1 lath.	Protect cable	$0.05	Any lumber company.
1 strip	½″ mesh hardware cloth 24″ x 60″	Support and guard for cable.	.60	Any hardware company.
60′	Soil-heating cable (lead-sheathed) (Rubber-sheathed $2.20.)	Heater	3.60	Any electric supply house.
6′	Insulated ground wire	Grounding	.10	Any electric supply house.
1	Weatherproof outlet	Service outlet	.15	Any electric supply house.
1	Weatherproof plug		.10	Any electric supply house.
1	Thermostat with outside manual control (400 watt size $2.20.)	Temperature control	9.00	Any electric supply house.
1	¾″ x 8′6″ galvanized iron pipe	Ground	.40	Any plumbing supply house.
2 lb	6d nails		.10	Any hardware company.
1 lb	½″ wire staples		.05	Any hardware company.
2	½″ bolts with wing nuts and washers	Bolting legs	.10	Any hardware company.
18	1½″ screws	Fastening legs	.10	Any hardware company.
1	Approved ground clamp		.20	Any hardware company.
		Total cost of all materials	$15.45	

Tools: Claw hammer, steel square, hand saw, screw driver, pliers, tin cutters. All wood should be sound, preferably cured. Sufficient rubber-covered cord with weatherproof plug to extend to nearest outlet is needed.

NEXT

CUT MATERIAL FOR BOX TO SIZE

(A water depth of approximately 17″ in the tank is assumed.)

1 Saw the 1″ x 4″ x 10′ to make:

Two—1″ x 4″ x 30″ sides of middle frame to rest on frame supporting hardware cloth and heating cable.

Two—1″ x 4″ x 22″ ends of middle frame to rest on frame supporting hardware cloth and heating cable.

2 Saw a 1″ x 8″ x 10′ for top frame in same way as the 1″ x 4″ x 10′ above.

3 Saw 1″ x 4″ x 8′ to make 3 pieces 1″ x 4″ x 20″ (for legs) and 1 piece 1″ x 4″ x 25¼″ or length required for giving additional support to heating cable. For determining length of legs in heaters of other depths, measure depth of the water in tank and add 3″, since box is to extend 3″ above normal water level.

4 Saw a 1″ x 8″ x 10′ to make:

Two—1″ x 8″ x 30″ sides of bottom frame.

Two—1″ x 8″ x 22″ ends of bottom frame.

5 Saw 1″ x 8″ x 36″ to make 1 leg 1″ x 8″ x 32″ (at least 12″ longer than other legs) so that outlet box and thermostat may be mounted on it above water.

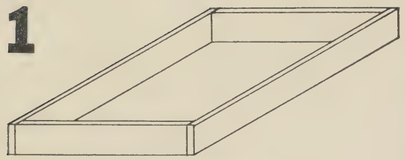
6 Cut two—24″ x 30″ pieces of hardware cloth.

7 Make 8″ grooved protector for cable leading up inside of box to thermostat. Groove half-round ¼″ deep and ½″ wide, or bevel off inside corners of 2 pieces of quarter-round to provide a similar groove, or build up from laths or strips ripped from laths.

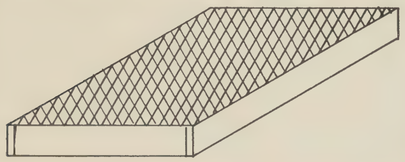
LASTLY

FOLLOW THIS ORDER IN ASSEMBLING STOCK TANK WATER HEATER

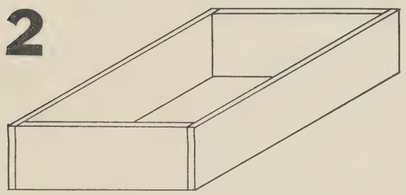
1



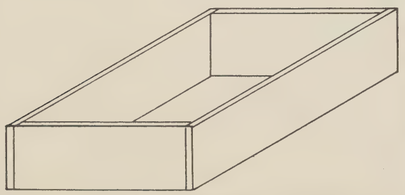
Build the 1'' x 4'' middle framework.
Cover the top with securely stapled hardware cloth.



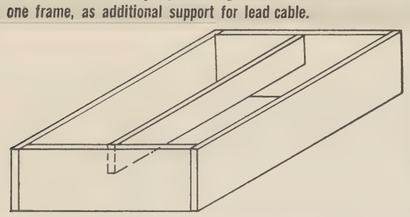
2



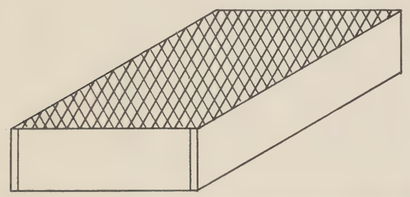
Build the two 1'' x 8'' frameworks.



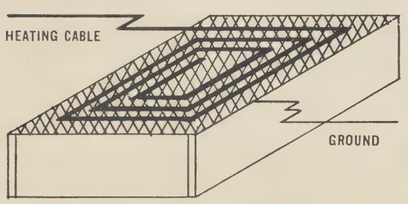
Nail a 1'' x 4'' x 28¼'' piece lengthwise across center of one frame, as additional support for lead cable.



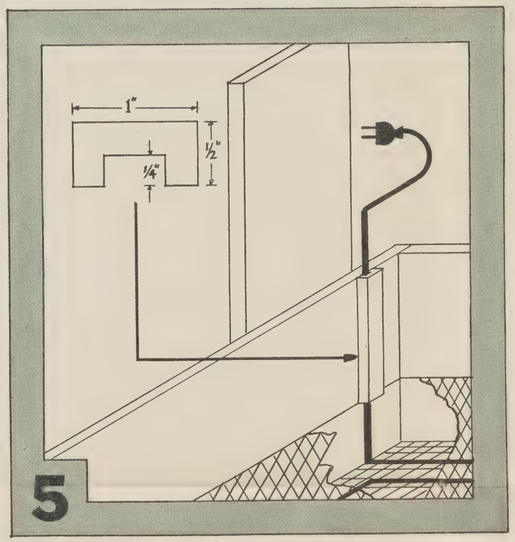
Cover frame with hardware cloth, and staple securely.



3 Double heating cable and coil it on top the hardware cloth. If lead-sheathed cable is used, handle with extreme care to prevent damage. In coiling cable, leave open or free ends about 2' long, starting in one corner and making the first coil (from the free ends) around the outside. Coil it spirally toward center. With lead-sheathed cable, keep space between double coils approximately 1½''; divide spacing by 2 for rubber-sheathed cable.

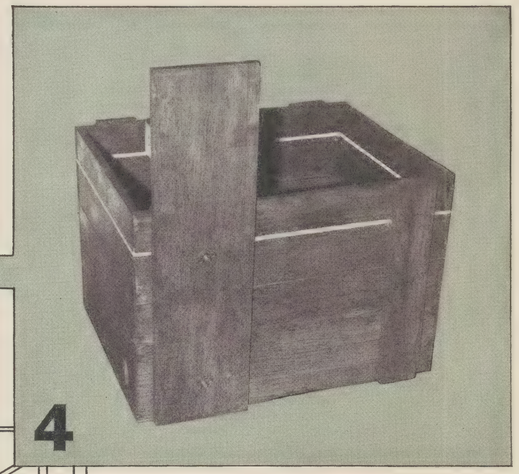


Tie cable to hardware cloth with string wrapped around cable, and then around one strand of the hardware cloth. Do not use wire instead of string. Solder ground wire to lower hardware cloth.



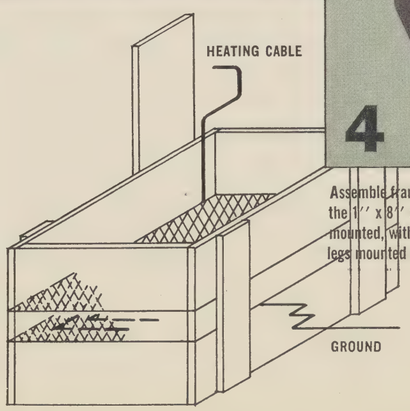
5

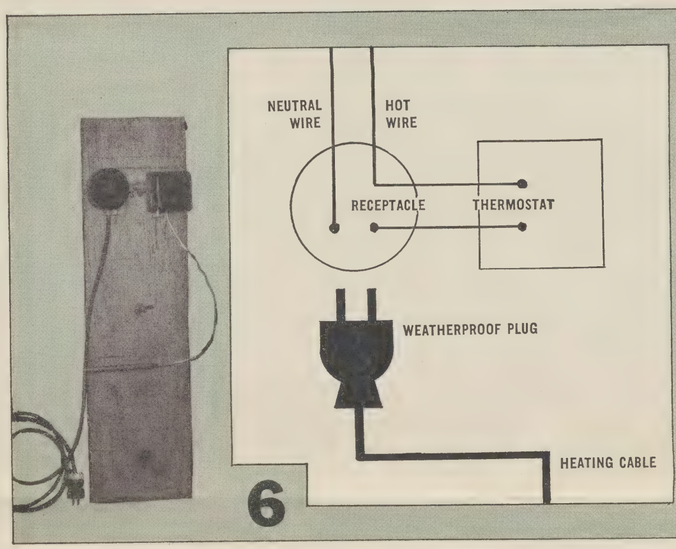
Groove strip and attach plug. Fasten free ends of cable to side of the box by placing the 8'' grooved strip of wood (or other protection) over cable and nailing to inside of box. Be sure nails through wood strip do not damage cable. Attach weatherproof plug to free ends of heating cable. Wrap plug with rubber tape and then with friction tape.



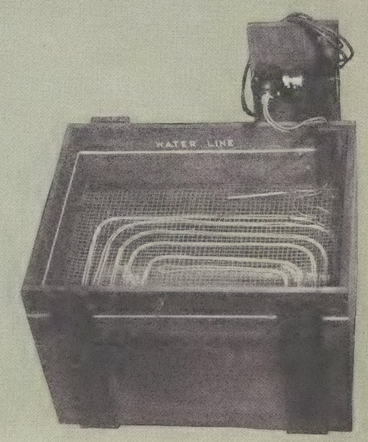
4

Assemble frames and mount legs. The 1'' x 4'' frame goes in the middle, above the 1'' x 8' on which the heating cable is coiled. Make sure that longest leg is mounted, with bolts, on corner where free ends of heating cable are left. (Other legs mounted with screws.)





6



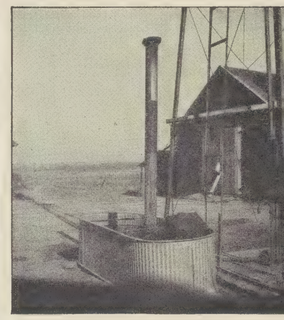
Place weatherproof service outlet on projecting leg, at least 4'' above surface of water in tank, but low enough so that soil-heating cable can be plugged into it. Place thermostat about 2'' to 4'' above or to one side of outlet. Use weatherproof service drop cable from nearest disconnect switch box to thermostat and to weatherproof convenience outlet. Fasten "hot" side of cable to one terminal on thermostat. Carry "hot" line from other terminal of thermostat to one side of convenience outlet. Carry neutral wire directly to convenience outlet. Fasten bulb of thermostat to inside of wooden box, about 2'' below surface of the water.

7 Drive a ¾'' x 8'6'' galvanized pipe 8' into earth at side of tank. Free end of the ground wire is to be clamped securely to this pipe, using an approved ground clamp.

8 Anchor heater by building framework or by fastening weights to legs.

9 Secure qualified electrician to inspect completed installation.

The electric way.



The old way.

AFTER IT'S BUILT, HERE ARE SOME HELPFUL HINTS ON OPERATION

The tank in operation.—This electric heater does not warm all the water in the stock tank. To do so would be wasteful as most of the heat would be lost by radiation. The water may be frozen over in the rest of the tank but kept warm above the heating cable because the frame is made of wood (a fair nonconductor of heat even though wet) and because the upper frame, having no outlet, retains the warmed water until it is drunk by the livestock. As they drink this warm water, cold water seeps through the cracks past the heating cable, keeping the water level in the heater equal to tank water level.

The thermostat is a device to regulate the water temperature. For stock tank heaters, the thermostat should be set so that temperature within the heater does not exceed 40° F. Some farmers are operating stock tank water heaters without thermostats by merely keeping the units on during cold weather. This of course requires more care in operating management and is likely to increase energy requirements. There is also a manufactured automatic heating element for stock tanks on the market. These units should be installed as recommended by the manufacturer, though they may be installed in the wooden box described in this folder.

Types of cable and thermostats available.—There are two types of soil-heating cable available for use: (1) Lead-sheathed, (2) rubber-sheathed. The former is more widely known. The more recently available rubber-sheathed cable is definitely less expensive. A simple thermostat suitable for wattages of up to but not in excess of 400 can now be secured at about one quarter the cost of the type of thermostat commonly used for large wattage installations. See the superintendent of your rural electric system for details. (Either thermostat can also be used on an electric hotbed. The long leg of the stock tank heater—with thermostat and outlet attached—is bolted on with thumb nuts so that it is easily removable.)

Grounding.—It is very important that one end of a ground wire be securely soldered to the hardware cloth on which the heating cable is mounted, and the other end attached in usual way to a properly installed ground rod or pipe. This is necessary for safety.

Operating cost.—Chances are remote that the water will freeze when the stock tank heater operates properly. Energy consumption should always be low. Consumption of one-fourth kw.-hr. per cow per day in a cold area test has already been pointed out. In any event, consumption cannot exceed 10 kw.-hr. per day. Costs will depend on electric rates, and, in general, the amount of electricity consumed on the farm. The more electricity used, the cheaper it gets.

Effects of warmed drinking water on livestock.—Besides saving the farmer the time and trouble of breaking ice, the object of heating water for livestock is to maintain normal consumption of water. In a fairly typical instance, during a 28-day period in January and February, the total gains made by some beef cattle at the Idaho Agricultural Experiment Station averaged 8 pounds higher per head for the group given warmed water as compared to the group given ice-cold water. Many farmers have come to the conclusion that the milk flow from their dairy cattle is about 10 percent higher when the water supply for the cows is warmed. In Minnesota, drinking cups apparently increased average milk production about 15 percent, as compared with the use of an unheated tank on the outside of the barn. Under similar conditions around Washington, D. C., experiments showed there was an increase of 5 percent in the milk flow.

When a stock tank is located in a protected place and is easily and continually available to livestock, sufficient water will be drunk if enough ice is melted to allow the stock access. As every farmer knows, animals stay out only a limited time in bad weather. When the tank is in an exposed place, more water will be drunk if its temperature is kept above freezing with an electric heater. The farmer can judge the benefits for himself.

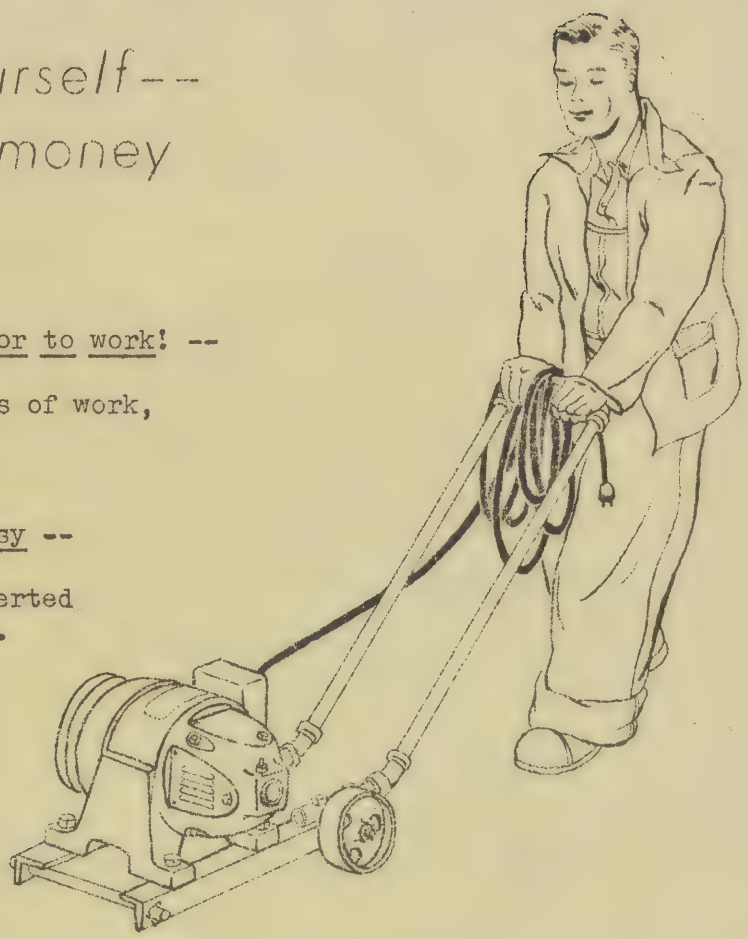
U. S. DEPARTMENT OF AGRICULTURE • RURAL ELECTRIFICATION ADMINISTRATION • WASHINGTON, D. C.

Form No. 642-U—9-40

16—18603 U. S. GOVERNMENT PRINTING OFFICE

MOTOR-TOTER

Make it yourself-- and make money



It will help you put your motor to work! --

More uses mean more hours of work, saves labor and money.

It makes motor connections easy --

Only one pin need be inserted to put motor in position.

It makes transporting the motor easy --

Little effort is required to roll the heavy motor from one job to the next.

It simplifies belt tension problems -- The weight of the motor maintains uniform belt tension at all times.

If you can use your electric motor in a variety of places, build yourself a motor-toter to make it easy for you to move your motor from one job to another. The more uses you can make of your motor, the cheaper it will be to operate. Spend a spare afternoon making a motor-toter and save money.

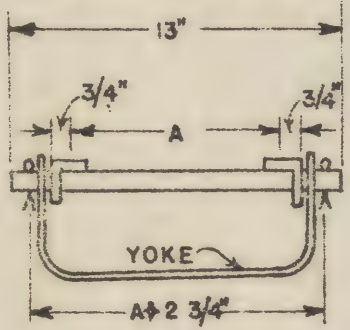
RURAL ELECTRIFICATION ADMINISTRATION

Washington, D. C.

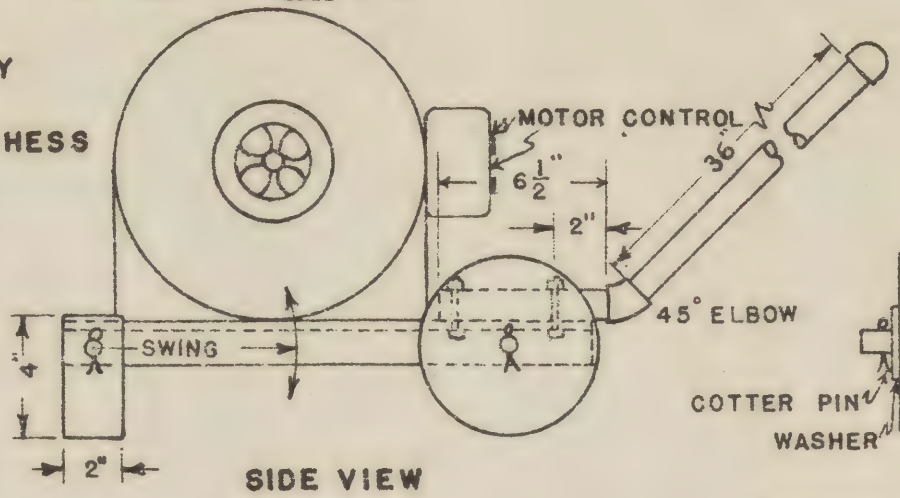
MOTOR-TOTER

FROM ORIGINAL BY

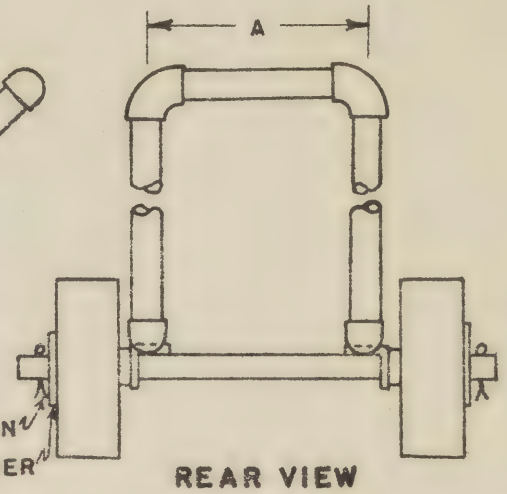
W. D. HEMKER & B. P. HESS



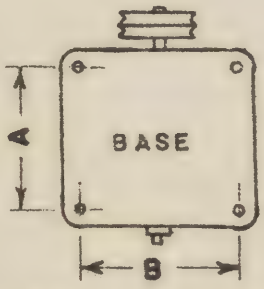
FRONT VIEW



SIDE VIEW

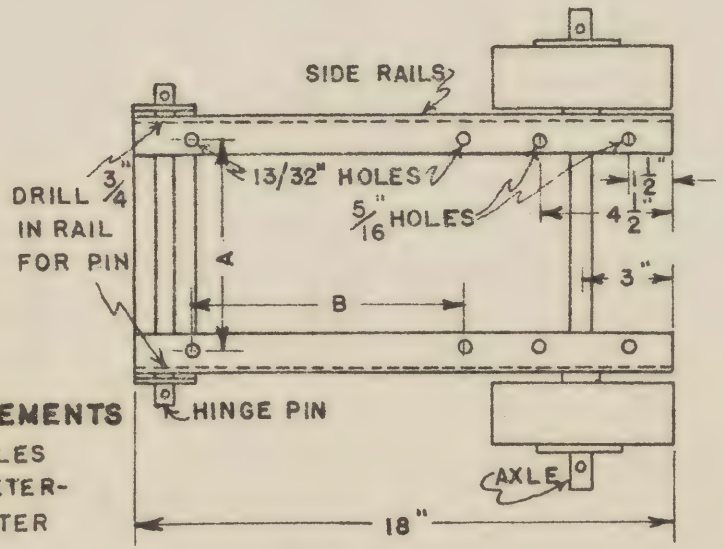


REAR VIEW



MOTOR BASE MEASUREMENTS

FOR PLACEMENT OF HOLES IN SIDE RAILS AND DETERMINING WIDTH OF TOTER



TOP VIEW

BILL OF MATERIALS

NO.	ITEM	DIMENSIONS	USE
2	ANGLE IRONS	1 1/4" x 1 1/4" x 1/4" - 18"	SIDE RAIL
1	BAR IRON	2" X 1/4" - 20"	YOKE
1	COLD ROLLED SHAFT	3/4" - 13"	YOKE HINGE PIN
1	COLD ROLLED SHAFT	3/4" - 18"	AXLE
2	PIPES	1" - 37"	HANDLE
3	PIPES	1" - 7"	HANDLE
2	45° ELBOWS	1"	HANDLE
2	45° ELBOWS	1"	HANDLE
2	BAG TRUCK IRON WHEELS	6" DIAM. 2" TREAD 3/4" BORE 2 3/8" HUB LENGTH	
4	MACH. BOLTS	3/8" x 1 1/2"	MOTOR TO SIDE RAILS
8	3/16" FLAT WASHERS	" " " "	
4	MACH. BOLTS	5/16" x 1 3/4"	HANDLE TO RAILS
4	COTTER PINS	3/16" x 1 3/4"	AXLE ENDS
2	3/4" FLAT WASHERS		AXLE

NOTES ON CONSTRUCTION

The six-inch wheels shown are satisfactory for transporting the Motor on hard smooth surfaces. If the "toter" is to be used on soft or rough ground the use of larger wheels is advisable.

For wheels larger than six inches the side rails should be lengthened one inch for each two-inch additional wheel diameter to permit wheel clearance. Example: For sixteen-inch wheels increase the side rail length from eighteen inches to twenty-three inches.

If it is found the larger wheels interfere with motor operation they may be removed easily after attaching "toter" to the yoke or the yoke may be permanently raised with blocks.

For convenience in changing the motor, provide a separate yoke for each belt job. The yoke hinge pin is easily removed to attach the motor and "toter."

The motor controls may be mounted permanently on the motor as shown, or they may be mounted on the handle of the "toter."

BELT CONNECTIONS

V-belts are recommended for use with the Motor-Toter to connect the electric motor to the equipment to be operated. The information given in the following tables should be used in making installations of motors to obtain the most satisfactory performance. Table I shows the number and size belts to use with various sizes and speeds of motors and motor pulley diameters.

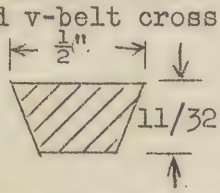
TABLE I

Size and Number of Belts

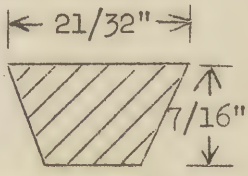
Motor pulley dia.	1/2 HP		1 HP		1 1/2 HP		2 HP		3 HP		5 HP	
	1750 rpm	3500 rpm	1750 rpm	3500 rpm	1750 rpm	3500 rpm	1750 rpm	3500 rpm	1750 rpm	3500 rpm	1750 rpm	3500 rpm
3"	A	A	A	A	2A	A	2A	A	3A	2A	5A	3A
4"	A	A	A	A	A	A	2A	A	2A	2A	4A	2A
5"	A	A	A	A	A	A	A	A	2A	2A	3A	2A
6"	A		A		A		A		B		2B	
7"	A		A		A		A		B		2A	
8"	A		A		A		A		B		2A	
9"	A		A		A		A		B		2A	
10"	A		A		A		A		B		2A	

Standard v-belt cross sections

"A" - 1/2" x 11/32"



"B" - 21/32" x 7/16"



NOTES:

(1) As indicated by the blank spaces, on motors rated at 3450 rpm or more the pulley diameter should not exceed 5". On motors rated at 1725 rpm to 1800 rpm the pulley diameter should not exceed 10".

(2) The minimum recommended pulley diameter with v-belts of "B" cross section is 6". For "A" cross section, minimum pulley diameter is 3".

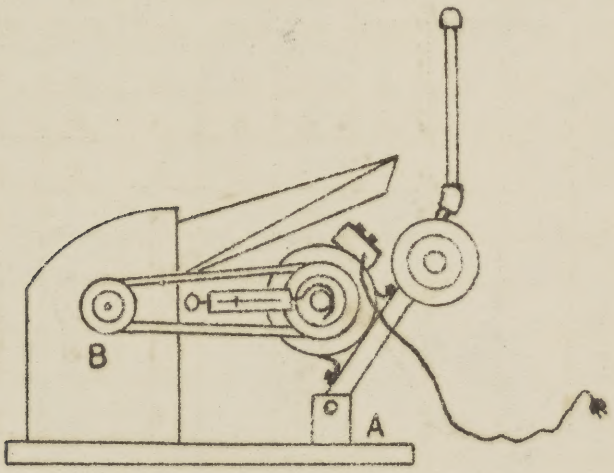
BELT TENSION

It is important to remember in connecting the motor to a machine that the proper belt tension be used. V-belts require less tension than flat belts and there is no need for excess belt tension that is sure to result in undue wear on both the belt and the bearings. Table II shows the proper belt tension in terms of pounds of pull on the shafts to obtain maximum efficiency and life of the belt and bearings. This pull can be conveniently determined with a spring scale. The pull must be measured along a line directly between the shafts of the motor and the equipment pulley.

TABLE II

(Proper force on motor shaft in pounds)

Motor pulley dia.	1/2 HP		1 HP		1 1/2 HP		2 HP		3 HP		5 HP	
	1750 rpm	3500 rpm	1750 rpm	3500 rpm	1750 rpm	3500 rpm	1750 rpm	3500 rpm	1750 rpm	3500 rpm	1750 rpm	3500 rpm
3"	18	10	36	18	54	27	72	36	108	54	180	90
4"	14	7	27	14	41	21	54	27	81	41	135	68
5"	11	6	22	11	33	16	44	22	65	32	108	54
6"	9		18		27		36		54		90	
7"	8		16		23		31		46		77	
8"	7		14		20		27		41		68	
9"	6		12		18		24		36		60	
10"	6		11		16		22		32		54	



Proper Way To Measure Belt Tension With Scale

EXAMPLE: 2HP motor; 1750 rpm; 6" pulley
Correct belt (see table I) would be a cross section "A".
Correct pull or force to be registered by scale to slacken belt (table II) is 36#.
If scale registers more, move yoke (A) farther from pulley B.
If scale registers less, move yoke (A) closer to pulley B.

PRECAUTION: PROPER SIZE AND TENSION ON BELT INSURES LONG LIFE TO EQUIPMENT. EXCESS BELT TENSION INCREASES BEARING WEAR AND SHORTENS LIFE OF BELT.

IT'S CHEAP AND EASY TO MAKE YOUR MOTOR PORTABLE

Any machine on the farm, ordinarily turned by hand, can be operated with a small electric motor at little cost. By making a small motor portable it can be used conveniently in more than a dozen ways to bring about savings in time and expense. Let electricity and a small portable motor do the job for you.

It makes your motor more useful.—One motor can be used for many purposes. More uses mean more hours of labor saving and money saving work with one motor. Put electricity to work, and make your farm operations easier and more efficient.

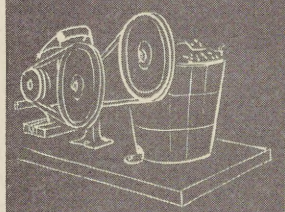
It's easy and cheap to equip.—For 50 cents to a dollar you can make your small motor portable. Only six different items are needed to do this and you can attach them in an hour's time.

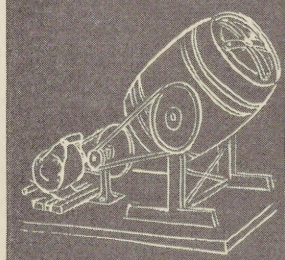
It reduces equipment costs.—With a portable motor it is not necessary to buy a separate motor for each machine.

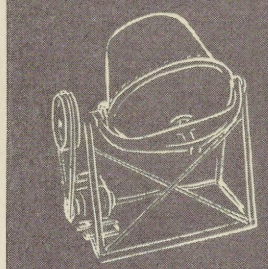
It's inexpensive to operate.—A ¼ to ½ horsepower portable motor costs but 1 to 2 cents an hour to operate. For 5 cents such a motor will separate 2,000 pounds of milk, turn a grindstone for 3 hours, shear 75 sheep, grind over 100 pounds of grain, mix 5,000 pounds of feed, or shell 25 bushels of corn, to name a few jobs it will do quickly and cheaply.

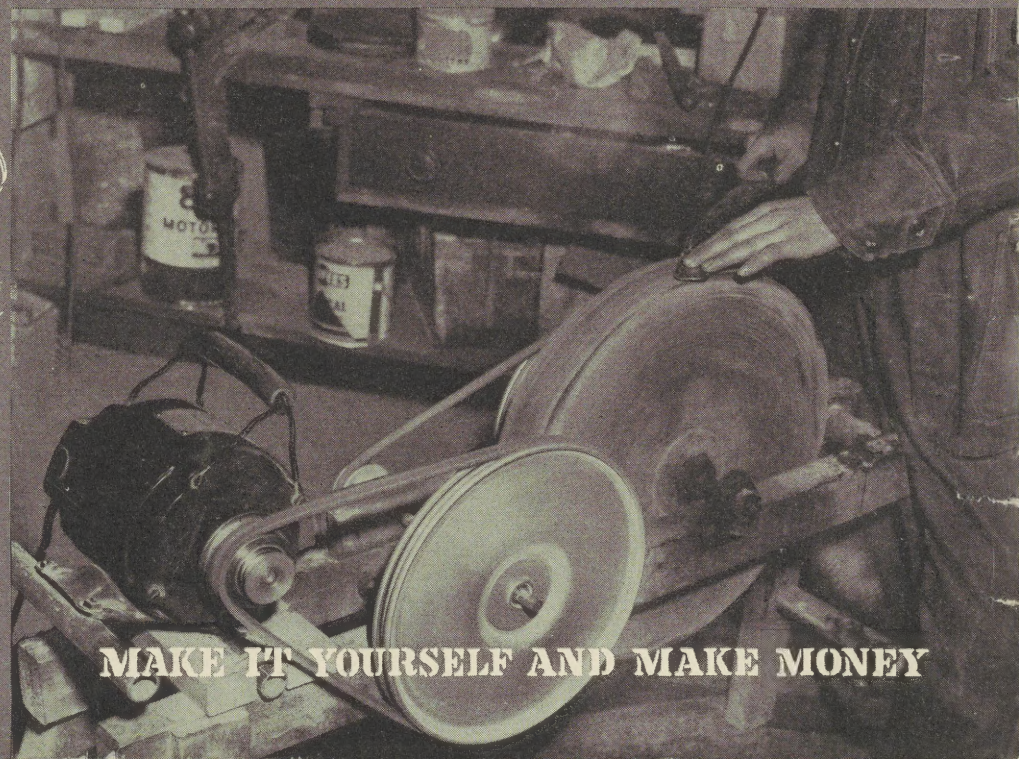
It's easy to move and use.—The convenient handle makes it possible to carry the motor from one job to another with one hand. Slip the motor rail into position next to a machine, attach the belt, plug in the extension cord, flip the switch and the machine is ready for use. The weight of the motor keeps the belt tight.

THE SMALL PORTABLE MOTOR

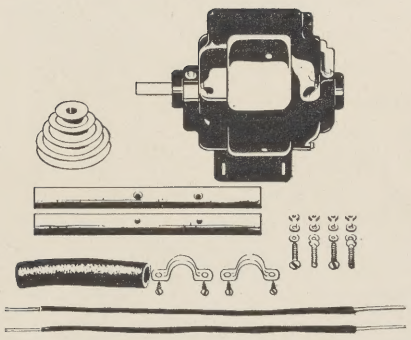








MAKE IT YOURSELF AND MAKE MONEY



MATERIALS NEEDED:

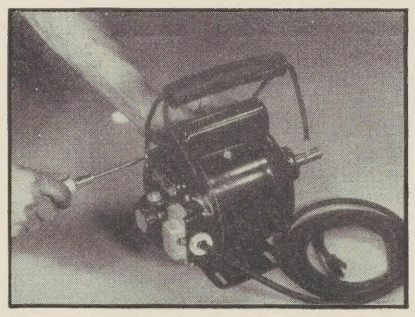
Four $\frac{5}{16}$ x 2" stove bolts Four plain washers Four lock washers	$0.15
Five or six inch piece of hose	.10
Two 18-inch pieces of insulated No. 10 solid conductor wire	.10
Two 12-inch pieces of $\frac{3}{4}$" galvanized iron pipe	.20
Ten $\frac{3}{4}$" pipe straps or Ten pairs of 12-inch 1"x1" wooden strips	.20
Approximate cost	$0.75

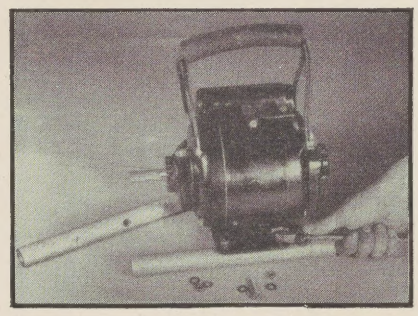
ASSEMBLING MATERIAL

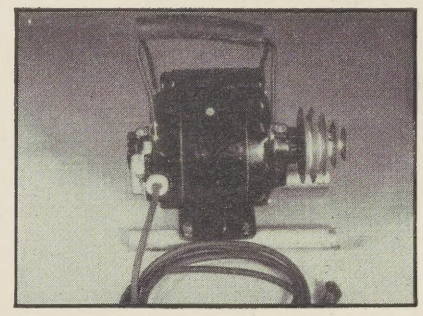
Fastening handle.—Twist the two wires together tightly in the center for a distance of 5 or 6 inches. Then slip the short piece of hose over the twisted part. After baring and flattening the ends of the wires, attach them to the two top frame bolts of the motor.

Bolting rails to motor.—The rails consist of the two pieces of $\frac{3}{4}$-inch iron pipe bolted to the base of the motor. Each rail should be long enough to extend from the outer edge of the pulley at one end to the outer side of the motor on the other. They are fastened with stove bolts, the heads of which are countersunk in the pipes. Ream or file the holes to provide for countersinking the bolts. To provide a smooth surface on the bottom of the pipe rails, grind or file the heads of the bolts after they are in place so they are even with the rounded surface of the pipes.

Completed motor.—At the right below is the completed motor, with handle and rails attached, having at least 10 feet of rubber covered extension cord with hard rubber plug, and a four step V-pulley.





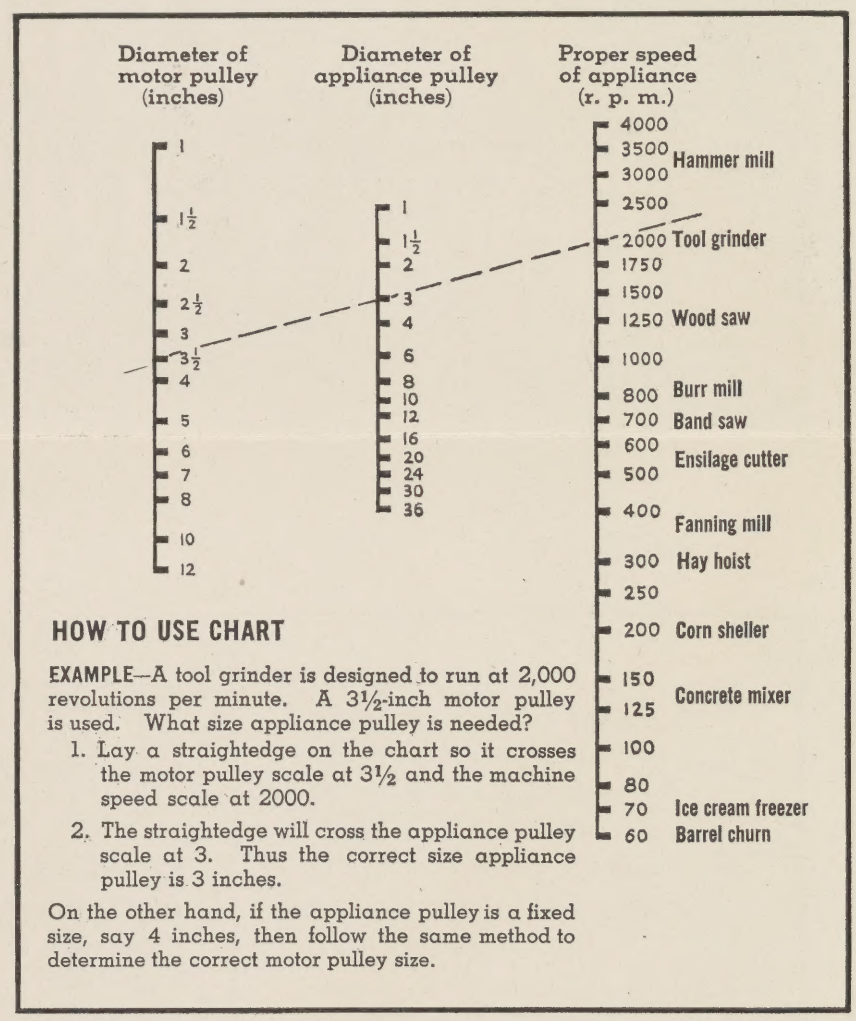


BEFORE USING MOTOR

Selection of pulleys.—The speed of the ordinary small motor is practically constant at 1,750 revolutions per minute; in any event the rated speed is stamped on the nameplate of the motor. Most appliances are designed to operate at definite speeds which are either marked on the appliances or will be furnished by the manufactures. To operate an appliance at the proper speed, it is necessary to have the right combination of pulleys on both the motor and appliance. The pulley selection chart will be helpful in determining proper pulley sizes when using 1,750 r. p. m. motors.

A four step V-pulley will permit wider latitude in the size of appliance pulleys. Thus it is quite possible to use existing flywheels as pulleys on many hand operated appliances. Because of their added traction power V-belts produce better results than do flat ones. However, V-belts operate satisfactorily on flat pulleys so it is not absolutely necessary to equip all appliances with V-pulleys.

With most slow rotating appliances, especially those previously operated by hand, it will be necessary to use a V-pulley speed reduction assembly. If the assembly is to be used on more than one appliance, it would be helpful to devise a means of quickly attaching and detaching it from the base of each appliance.

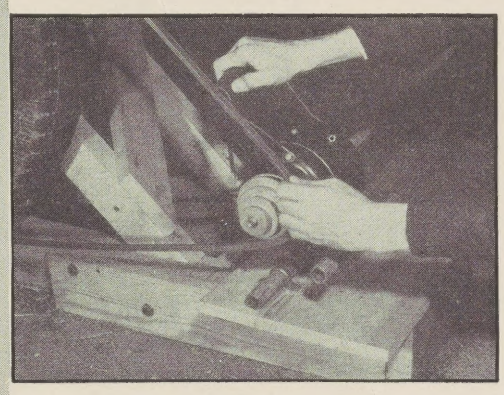


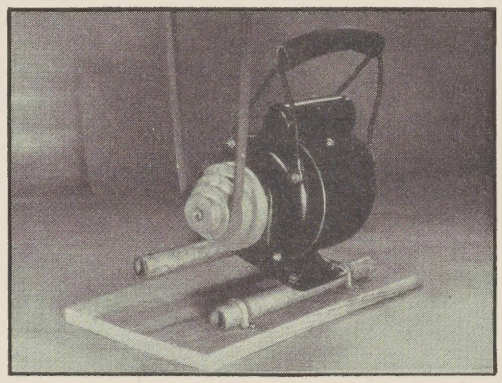
HOW TO USE CHART

EXAMPLE—A tool grinder is designed to run at 2,000 revolutions per minute. A 3½-inch motor pulley is used. What size appliance pulley is needed?

1. Lay a straightedge on the chart so it crosses the motor pulley scale at 3½ and the machine speed scale at 2000.
2. The straightedge will cross the appliance pulley scale at 3. Thus the correct size appliance pulley is 3 inches.

On the other hand, if the appliance pulley is a fixed size, say 4 inches, then follow the same method to determine the correct motor pulley size.





Location of motor.—Although an electric motor will operate under very adverse conditions, care in operation will add years to its life. Wherever possible locate the motor in a dry place, free from dripping water, damp air, or dust.

Before deciding upon the various locations of the motor, survey the probable uses of it in order to use as few belts as possible. V-belts cannot be lengthened or shortened.

The lower side of the belt should be on the pulling side of the motor to eliminate the tendency of the motor to climb the belt and topple over. Although not always practical, it is best to have the pulleys of the motor and appliance at about the same level. On some appliances such as a corn sheller or fanning mill it may be necessary to build a platform on which the motor can be permanently mounted.

Small appliances, such as an ice cream freezer, meat grinder, or emery wheel, can be operated more conveniently if they and the motor are attached to a solid base or the workbench. Many appliances require the use of a speed reduction assembly; this should be provided for when attaching the appliances.

Holding motor in place.—The motor is held in place either with two wooden cleats or by two pipe straps through which one of the pipe rails is inserted. The wooden cleats permit greater ease in inserting or removing the motor and should be spaced so that the pipe rail fits snugly between them. When the pulley of the appliance is higher than the motor pulley, the pipe straps are better to use. If the motor tends to vibrate sideways so that pulleys are out of line, drive a nail at the end of the pipe rail.

After deciding upon the proper location for the motor near an appliance, fasten two wooden cleats or two $\frac{3}{4}$-inch pipe straps to the base of the appliance. Before fastening them permanently, however, slip the motor into place and test its position by attaching the belt to the motor and appliance. The motor should be slightly tilted so that its weight keeps the belt tight but so there is not undue strain on either pulley. It may be necessary to enlarge the straps a little so that the pipe rail will slip in and out easily.

HINTS ON OPERATION

Selecting the proper motor.—Two portable motor units—one 1/4 to 1/2 horsepower and another 1 to 5 horsepower—will operate nearly all the usual appliances not provided with attached motors. The small motor, described here, can be used on most small appliances while the large one, to be mounted on the motor toter, will operate large equipment such as a wood saw.

A general purpose portable motor should be sufficiently large to handle the largest equipment to be operated by it, even though there is slight loss of efficiency when the motor is used on low loads. This loss is negligible in comparison with the cost of providing an additional motor. For example, it is practical to use a 1/2-horsepower motor for short periods of time, on equipment requiring even as little as 1/6 horsepower.

The following list of small equipment and the size motor needed may be useful in helping you select a small motor to most effectively serve your needs.

Appliance	Size motor (horsepower)
Churn	1/4
Cream separator	1/6 to 1/4
Ice cream freezer	1/4
Meat grinder	1/4
Corn sheller (small)	1/4
Fanning mill	1/4
Feed mixer (small)	1/3 to 1/2
Fruit or vegetable grader	1/4 to 1/2
Green feed cutter	1/4 to 1/2
Polisher or cleaner	1/4
Shearing tool	1/4
Farm shop tools:	
Band saw or small circular saw	1/4 to 1/2
Concrete mixer (small)	1/4 to 1/2
Drill press	1/4 to 1/2
Emery wheel or grindstone	1/4
Forge	1/4 to 1/2
Lathe	1/4
Paint sprayer	1/4 to 1/2

Care of motor.—The chief requirement in the care of the motor is oiling. Use a light machine oil, but avoid using too much as it may leak into the commutator and windings and impair them. Protect the motor from moisture and dust as both reduce the effectiveness of the insulation. The useful life of the motor will be lengthened if these simple instructions are followed.

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL ELECTRIFICATION ADMINISTRATION

REA has developed other low-cost ways to put electricity to work on your farm. The "Make-It-Yourselfs" listed below are easy and inexpensive to build. They are all cheap to operate. Each of the folders describe in detail, by means of illustrations and specific instructions, how to build other useful electrical equipment for the farm. In a short time this equipment will pay for itself many times over.

The "Make-It-Yourselfs" are money-savers because they are time-savers. Their use is an important forward step toward the more profitable use of electricity. These folders are free upon request to Information Division, Rural Electrification Administration, Washington, D. C.

1. Electric Chick Brooder.
2. Stock Tank Water Heater.
3. Electric Pig Brooder.
4. Electric Feed Mixer.
5. Small Portable Motor.
6. Motor Toter.